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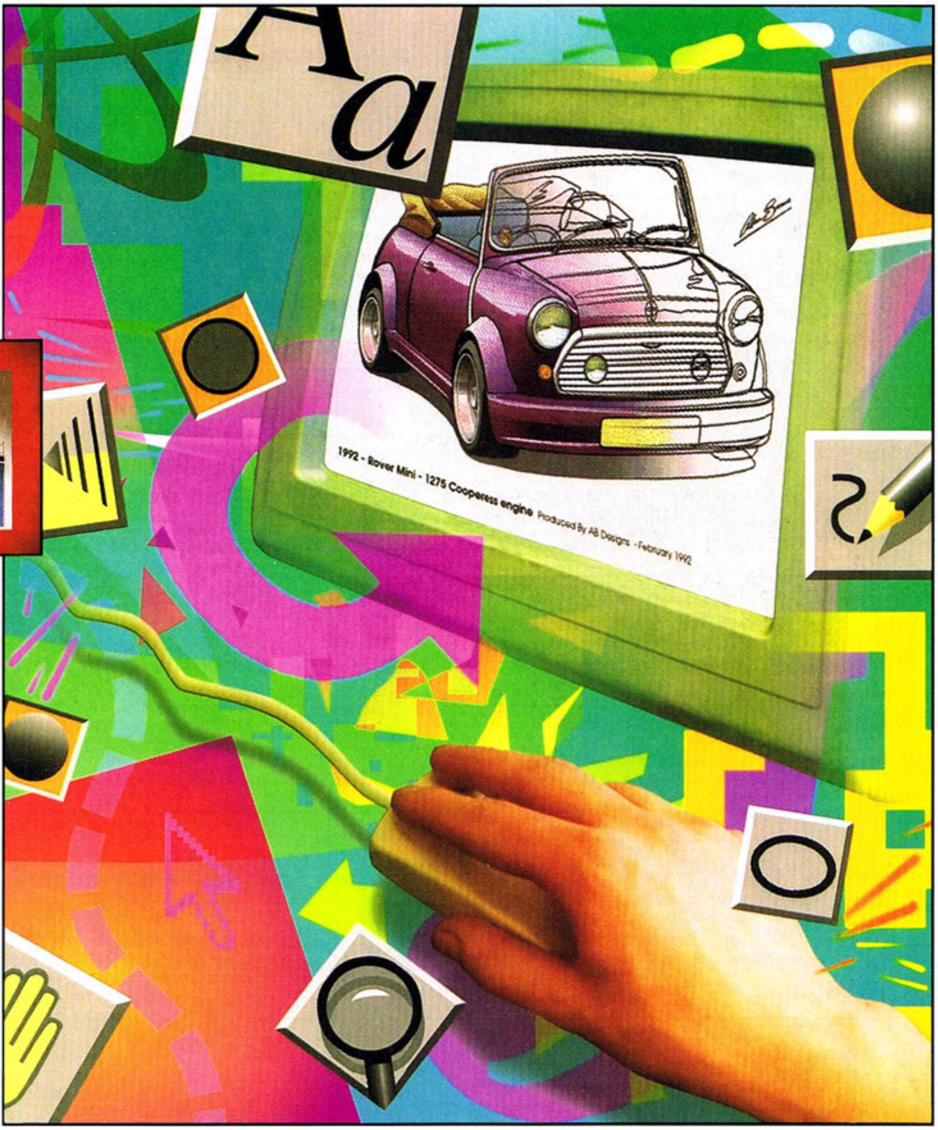


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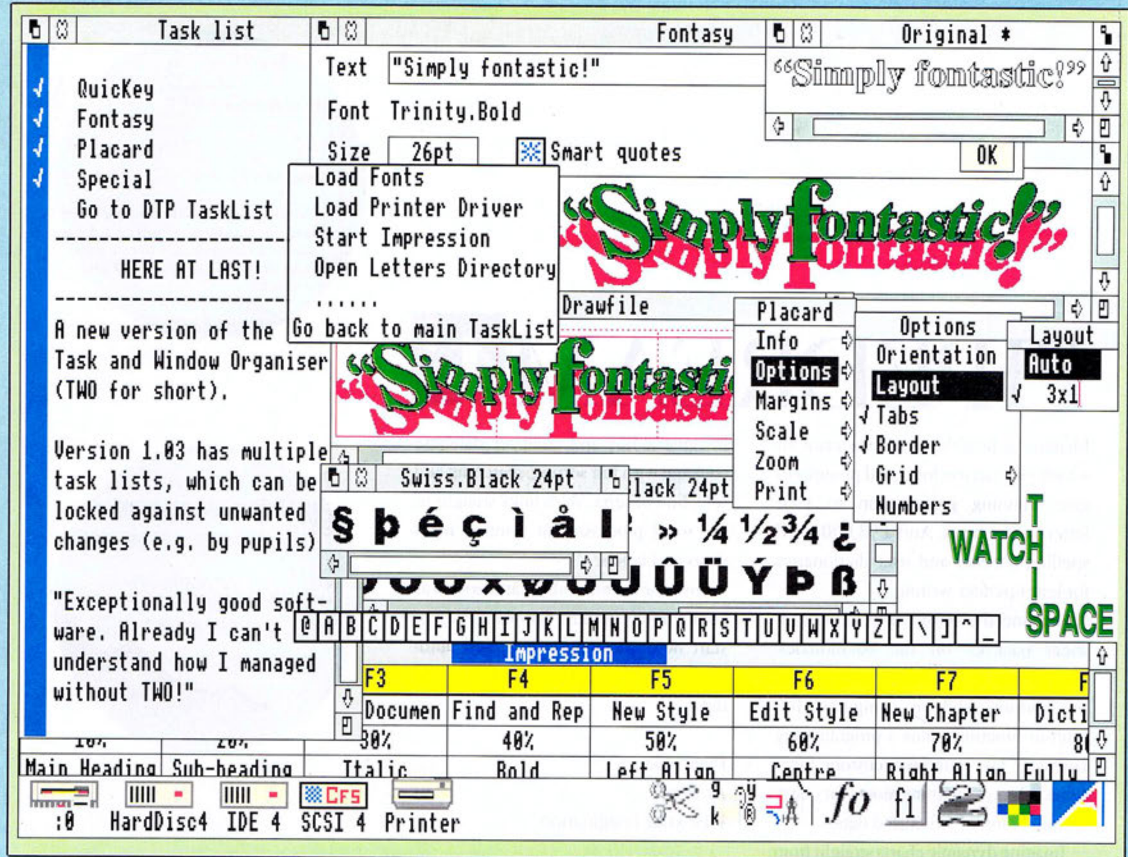
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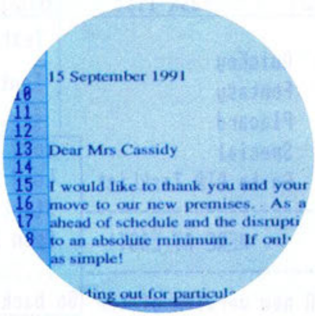
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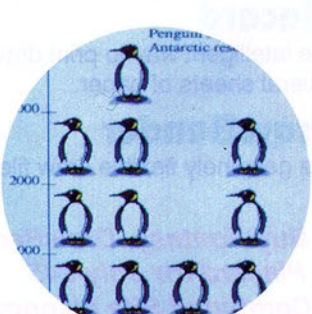
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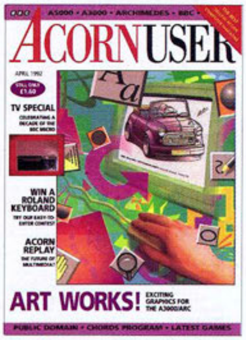
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ISSUE 117



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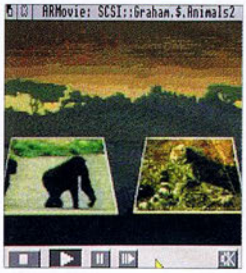
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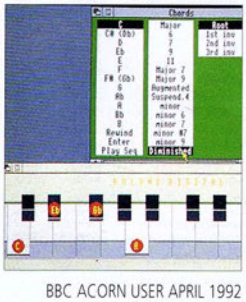
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2Mb Hard Disc Colour System	Acorn	£1499
– as above + Learning Curve		£1530

(Finance & special purchase schemes available)

MEMORY

Fitting extra unless otherwise stated
† Fitting easy ‡ Fitting needs expertise

A3000 2 Mb Non-upgradable †	IFEL	£55
A3000 2 Mb Upgradable †	IFEL	£63
A3000 4 Mb †	Atomwide/IFEL	£149
A310 2 Mb Upgradable soldered ‡	IFEL	£99
– as above + MEMC1a		£149
– as above + MEMC1a + fitting		£200
A310 4 Mb soldered + MEMC1a ‡	IFEL	£225
– as above + fitting		£277
– as above + fitting + OS3 carriers		£298
A5000 2 - 4 Mb Upgradable †	Atomwide	£109
A5000 2 - 8 Mb including fitting	Atomwide	£500
A5000 4 - 8 Mb including fitting	Atomwide	£391
A540 4 Mb †	Atomwide	£268

MISCELLANEOUS

•386C PC Expansion Card	Aleph One	£489
4-slot 4-layer Backplane	IFEL	£59
9060S Monitor	Eizo	£450
9070S Monitor	Eizo	£640
A300/400 Fan kit	ICS	£15
A310 RISC OS Carrier Board ‡	IFEL	£25
•A5000 Fitting Kit for second hard disc	ICS	£15
ARM3 ‡		£249
Clares Micro Mouse	Clares	£26
Dongle Dangle with screw fittings	ICS	£6
Fan filters (pack of 10)	ICS	£4
FaxPack	CC	£289
Monitor Stand for A3000	ICS	£18
•TouchWindow	Lindis	£234
Whisper Fan Quietener	ICS	£15

HIGH DENSITY 3½" FLOPPY DISCS

Pack of 10		£10

PRINTERS

ArcLaser	Calligraph	£895
ArcServer	Calligraph	£985
Bubble Jet BJ-10e	Canon	£205
Bubble Jet BJ-300	Canon	£360
Bubble Jet BJ-330	Canon	£405
Laser Direct HiRes4 with 50-sheet tray	CC	£895
– 250-sheet Paper Cassette		£99
Laser Direct HiRes8	CC	£1280
Laser Direct LBP-4 Card	CC	£319
Laser Direct Qume	CC	£749
LBP-4	Canon	£659
Refill toner cartridge for Canon EPS		£50
New toner cartridge for Canon LBP-4		£59

SCANNERS, DIGITISERS

ArcScanner including Epson GT-4000	Clares	£1660
FaxScan	Spacetech	£94
FX9600AT + Maintenance	Amstrad	£376
Hawk V9	Wild Vision	£199
– A3000 version	Wild Vision	£278
Image (colour)	Irlam	£589
Image Scanner	Iota	£389
– Colour upgrade	Iota	£98
i-Scan 200	Irlam	£539
i-Scan 400	Irlam	£589
Pineapple Colour Video Digitiser	Pineapple	£195
– A3000 boxed	Pineapple	£230
Scan-Light A4	CC	£277
– with Sheet Feeder	CC	£370
Scan-Light Junior	CC	£128
– A3000 internal	CC	£128
Scan-Light Junior 256	CC	£199
– A3000 internal	CC	£199
Scan-Light Professional	CC	£825
– as above + SCSI interface	CC	£910
•SnapShot Colour Video Digitiser	Lingenuity	£195
– A3000 version	Lingenuity	£275
Spectra	RISC	£545
– A3000 Internal	RISC	£545
– A3000 External	RISC	£565
•Video Digitiser	HCCS	£49

I²C PRODUCTS

AnDi Oddule	Baildon	£49
I²C Adaptor (needed unless you already have an I²C socket)	Baildon	£10
I²C SWI (enhanced IIC_Control)	Baildon	£15
– bought with Oddule		£5

KEYBOARD COVERS

Seal 'n Type (spill-proof)		
– Archimedes / A5000	Kador	£14
– A3000	Kador	£14

FUNCTION KEY STRIP ORGANISER

Arckey	ICS	V0 £3
– pack of 4		V0 £10

HOW TO ORDER

VAT: UK customers please add 17.5% to the total price, except for the zero-rated items marked V0. Our VAT number is 595 7258 84.

CARRIAGE IS FREE WITHIN MAINLAND UK IF YOU PAY ON ORDERING. *Remember this when you compare prices!*

Overseas carriage: If you are paying by credit card we will add airmail and insurance at cost. Otherwise please add £6 (Europe) or at least £12 (elsewhere) for each software item and send a pounds sterling bank draft payable in England, or Eurocheques for not more than £100 each.

Credit cards are welcome. We do not charge your account until your order has been fulfilled. The name and address for delivery of goods should be as known to the credit card company. If you are leaving an order on our answering machine please include your telephone number, the expiry date of your card, and your calculation of the total payment due.

Official orders are welcome. Payment is due in 14 days. Invoices are subject to carriage and late payment charges.

Site licences: please enquire if no price is shown.

All products, prices and specifications are offered in good faith and are subject to change without notice. Your order will receive our attention immediately, but suppliers sometimes keep us waiting. Goods are guaranteed but we do not supply them on approval.

Thinking IDE?

We've got a brand new

ideA

After 1½ years' experience in selling IDE products for Acorn computers (more than twice that of any rival), we are pleased to announce a new release of the IDE Filing System by ICS. Completely rewritten in the UK, the new ICS IDEFS offers improved speed and added features such as password protection.

Existing ideA users can upgrade for just £15 + VAT, returning the old eprom afterwards. Please specify your interface type.

New customers should telephone ICS or contact their local dealer for information on our complete range of IDE hard disc upgrades.

FREE Compression WORTH £57 !

when you buy direct or from participating dealers.

You may well find cheaper suppliers (and less advanced products). But our advice is

Don't take risks –

Ask for ICS

It's where the ideA came from!

AUTHORISED ACORN DEALER

ICS (Ian Copestake Software)

Dept B29, 1 Kington road, West Kirby, WIRRAL, Merseyside, L48 5ET

Tel: 051-625 1006 Fax: 051-625 1007

E&OE SO39 92FE24

LICENSED CREDIT BROKER

BIGGER VENUE FOR 1992 BBC ACORN USER SHOW

WEMBLEY Exhibition Centre will once again be the venue for the *BBC Acorn User Show* this Autumn.

Following the success of last year's event at the Wembley Conference Centre, which attracted over 10,000 people, this year's show will be held in the larger hall three of the Wembley complex. This will enable visitors to be admitted more easily and help avoid the queueing problems which resulted from Wembley safety regulations last year.


A bigger venue will cater for crowds expected at this year's show

The show dates are Friday October 16 to Sunday October 18 1992, although the organisers, Safesell Exhibitions, are also keeping options open on an extra day (possibly Thursday October 15) for a special educational preview.

Discussions are taking place with Acorn Computers concerning the company's involvement with the show. With Autumn being a key time for new products, it is likely that the company will once again use the show as a launchpad.

Meanwhile, a large number of exhibitors from the Acorn marketplace have already booked space and early indications are that the show will be bigger and better than ever.

Watch *BAU* for more details in the near future – meanwhile, make a note in your diary for October 16 to 18.

Initial enquiries concerning stand space should be directed to Safesell Exhibitions. Tel: (0737) 814084.

DIRECT COLOUR FOR THE ARC

AFTER the success of the Archimedes-dedicated Laser-Direct printer range, Computer Concepts has turned its attention to the colour printing market. The result is ColourDirect, a 24-bit colour printing package based around Canon's brand-new BJC800 colour ink-jet printer. The BJC800 is a 360dpi (dots per inch) printer and, unlike some of the cheaper alternatives, the Canon is said to print true blacks resulting in superior contrast. ColourDirect printouts seen by *BAU* were certainly impressive. Another advantage of the BJC800 is that it can print up to A3.


The BJC800 used in the ColourDirect package from Computer Concepts

Risc OS only handles eight-bit colour palettes at present, which limits printed results to 256 colours, even though the Archimedes has a selection of 4096 colours. However, Computer Concepts' printer driver is 24-bit colour capable, to match the ability of the printer. This provision also anticipates future Archimedes video chip developments. CC also claims its printer driver code, which addresses the parallel port directly, is extremely fast and can work in the background.

Computer Concepts sees ColourDirect as a perfect match for the new *ArtWorks* package, as well as for existing *Impression* users. ColourDirect is due shortly and has a recommended price of £1995 plus VAT. At a later date, computer Concepts plans to sell the printer driver separately. Tel: (0442) 63933.

NEWS IN BRIEF

● **THREE** Acorn A5000 computers are at the heart of a new in-store broadcasting system being used by Asda supermarkets. The superstore chain has set up its own AsdaFM radio station which broadcasts to its 150 outlets via the Astra TV satellite. The three A5000s control scheduling operations, CD jukeboxes and an ISDN (Integrated Services Digital Network) telephone line, which distributes signals to the satellite uploader. The system is provided by Norsat International subsidiary, In-Store Media. Norsat's European director, Tom Woodford, explained that A5000s were chosen because of their networking and multitasking abilities – which means any one machine could take over the functions of another, guaranteeing reliability. Archimedes are now controlling operations at four other independent local radio stations – two in the UK and two in Malaysia.

● **AROUND** 100 works of art created by sixth form students from the London Borough of Enfield are being displayed on an Archimedes computer, which has been loaned by Acorn to the Design Council in London. The computerised art exhibition is the culmination of a project run by the Borough of Enfield to provide students with some experience in computer graphics. Initial designs were drawn on paper or photographed and then transferred to computer by using Minerva Software's Atelier paint program on the Archimedes. The selection of resulting pictures was then installed on an Archimedes running an Acorn sprite slide show utility called Picture. The exhibition will be at the Design Council until the summer.

● **IN THE** March issue we stated that the price of the Aleph One PC card with 1Mb RAM was £595 plus VAT. It has since been reduced to £495 plus VAT.

● **ACE COMPUTING**'s *Euclid* package was used to create and animate a ham sandwich for Central TV's series People Who Count. It will appear on April 1. Contact Ace Computing on (0223) 322559.


INCLUDES TWO FREE GAMES CREATED USING THE "FLIGHT SIM TOOLKIT"
FLIGHT SIM TOOLKIT
The flight sim toolkit contains 5 Risc OS tools which let you create your own flight simulator!
!Shape – Design aircraft, building, runways, roads and rivers.
!Model – Aerodynamic a/c model editor.
!Cockpit – Design instrument panel and displays.
!World – Create your virtual world, set up enemy airfields, defences and supply lines.
RRP £44.95
Available from: Simis Limited, 26 Chitty Walk, Keens Park, Guildford, Surrey GU3 3HW
Telephone: (0483) 233048
SiMiS

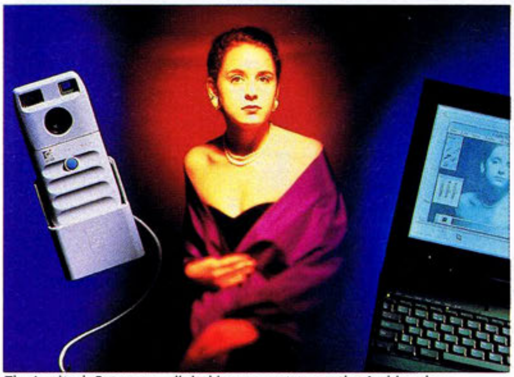
IDEAS FROM ANOTHER WORLD

KEEP an eye on the IBM PC-compatible market and, when a good idea comes along, make it work on the Archimedes. That is the strategy adopted by DT Software, which this month launches several new products.

First is a Floptical 21Mb floppy disc drive. This is a conventional looking 3.5in drive which has ultra-thin magnetic data tracks enabling a much greater recording density. Instead of the normal 135 tracks per inch (tpi) density, Floptical packs have over 1000tpi. A tiny LED optical sensor is used to guide the heads along laser etched grooves. It remains compatible with all existing 3.5in floppy disc media.

The Floptical drive is a SCSI device and DTS provides the necessary software for operation in the Archimedes environment. The drive is priced at £399.95 plus VAT and blank 21Mb discs will cost around £15 each.

Another new peripheral from DTS is Logitech's Fotoman camera. This is a black and white solid state camera which stores up to 32 pictures digitally in on-board Ram. Pictures are then downloaded to your machine via the serial port. DTS already sells an Archimedes camera system based around the Canon Ion still-video camera. This system is colour whereas Fotoman is strictly monochrome, but the theory goes that Fotoman images will be considerably sharper, and of higher resolution because the image data is first-generation.


The Logitech Fotoman – digital image capture on the Archimedes

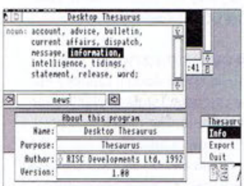
By comparison, analogue still-video images must first be digitised, a process which introduces a certain amount of distortion, and the luxury of colour must be paid for in lower resolution. The Fotoman camera can also take standard video camcorder lens attachments. An Arc Fotoman system is £553.15 plus VAT.

Finally, DTS has a new range of badged multiscan monitors sourced from Japan. The range is made up of 14, 15, 17 and 21in displays. DTS points out that its monitors operate a scanning range of 15-38KHz, ideal for Archimedes screen modes, including modes 12 and 15. Other multiscan monitors often scan between 30-65KHz, which is not suitable for lower resolution screen modes.

The 15in and larger models also sport a four-setting video pre-set to minimise the need to constantly re-adjust the screen position when changing between certain screen modes. Prices are: 14in, £297.82; 15in, £485; 17in, £680.80; and 21in, £1046.76 (plus VAT).

Contact DT Software on (0223) 841099.

WORDS AT YOUR FINGERTIPS



RISC DEVELOPMENTS has announced *Desktop Thesaurus*. Over 11,000 key words are linked to a dictionary of about 90,000 synonyms. All the user has to do is type a word into a window and suggested synonyms are listed in grammatical groups. Risc Developments says *Desktop Thesaurus* will work with most applications which involve text editing, including *Impression* and *Ovation*, even though there is no standardised 'hot-linking' in Risc OS.

The dictionary can also be modified by the user. To save memory, data is accessed from disc where it is stored in compressed form. By the time this issue of *BAU* is out, *Desktop Thesaurus* should be on sale, at the very reasonable price of £19 plus VAT.

Computer Concepts is expected to release its thesaurus at a later date. *Word 4 Word* will be based on the *Collins Gems Thesaurus*. CC hope to make *Word 4 Word* work in the background, and with later versions of *Impression*, double clicking on a word will start the search through the thesaurus. The synonyms are then shown a window, and clicking on one will replace the selected word.

Contact Risc Developments on (0727) 40303 and Computer Concepts on (0442) 63933.

NEWS IN BRIEF

● The Acorn Software Roadshow is to roll once more in May, with five venues between May 11 and 15, starting off in Aberdeen in Scotland and ending in London. The schedule is as follows:
May 11, Northern College, Aberdeen; May 12, Mid/South Scotland, (venue to be announced); May 13, Cleveland ECC, Morton College, Middlesborough; May 14, Education Development Centre, Sandwell; May 15, ILEC Centre, London.

Another roadshow week is planned for November 23 to 27. For further information contact Acorn Computers on (0223) 245200.

● Dublin-based EMCEE Distribution Ltd has been appointed by Acorn as its sole distributor in the Republic of Ireland. EMCEE's task will be to build on Acorn's strength in Irish primary schools and increase the company's presence in secondary schools, where the main competition comes from Apple Macintosh computers.

Marketing director Mike O'Riordan said that he hoped Acorn Learning Curve packs would increase the number of Archimedes used by families at home, complementing those already used at schools. EMCEE will be flying the Acorn flag at Computex, Ireland's biggest computer exhibition, at the end of March. The Irish President, Mary Robinson, recently opened a new 20-Archimedes computer room at the Good Shepherd Primary School in Churchtown, Co Dublin.

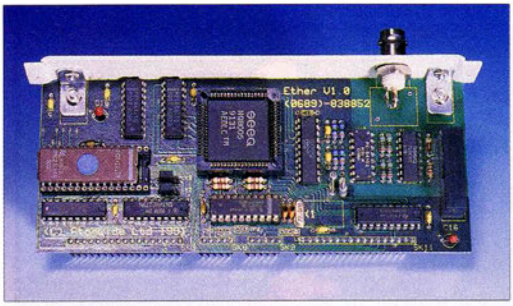
● Sherston Software has just released Split an Image, a range of cartoon clip art in Draw file format featuring the likes of John Major and Frank Bruno. The cartoons were drawn by artist Paul Hutchinson and transferred to Draw format by Sherston who have ensured that the caricatures remain easy to edit in Draw. Also included are a range of bodies to attach the heads to, and a book on how to use Draw to make the most of them. The pack contains around 100 cartoons and costs £19.95 plus VAT. Contact Sherston Software on (0666) 840433.

FASTER NETWORKING ON THE ARC

ETHERNET looks set to become a faster solution to networking on the Archimedes and BBC A3000. It can work up to 20-times faster than Econet and is rapidly becoming an industry standard for IBM PCs, Apple Macs and Unix machines.

Acorn first provided an Ethernet interface card for the Archimedes when the Unix-based R140 derivative was launched three years ago. Now Atomwide Ltd has joined in by releasing a pair of Ethernet cards: one is 16-bit version for the Archimedes' standard podule expansion bus, and the other a compact (eight-bit) version for the A3000's internal slot.

Ethernet on the Archimedes can be used as a faster alternative to the traditional but ageing Econet system. Alternatively, it can be employed as a way of attaching Arcs to existing Ethernet networks. Acorn already provides TCP/IP connectivity protocols for the latter, and the forthcoming Acorn Universal Network system will provide Ethernet networks with an extended Econet-style environment, compatible with level four file servers. Both versions of the new card cost £229 plus VAT. Contact Atomwide on (0689) 838852.



The A3000 version of Atomwides' Ethernet card

SOFTWARE SHOW

WHETHER you are are a first-time buyer or an expert, choosing software for business and home use can be a challenge. Which is why you should tune in to *The Software Show*, a 90-minute programme covering all you need to know about choosing and using software for profit. Aimed at both business and home users, there will be plenty of advice on choosing software for a variety of platforms, including the Archimedes.

Helpful case studies featuring companies and individuals making software choices will be included. The programme will also cover training, data protection, viruses and piracy.

The programme will feature an Archimedes in the studio, which will be running popular software, such as *Pipedream* and *Impression*. There will also be a special competition to win the software featured.

The programme will be shown on BBC 1 at 10.30am on Sunday March 29. British Summertime falls on this day, so be sure to set your clocks back by one hour!

WATFORD TO LAUNCH A NEW PC PODULE

FOLLOWING hot on the heels of the first Archimedes PC podule from Aleph One, Watford Electronics has revealed details of a rival PC podule designed by prolific ex-Computer Concepts hardware expert, Chris Honey.

Apart from sharing the goal of providing a full-speed hardware-based PC environment on the Arc, it is interesting to note that the two competing designs differ in more than just minor details. The Watford card will feature a 25MHz AMD 386SX PC chip, claimed to be 25 percent faster than the 20MHz Intel 386SX processor used by Aleph One. While Aleph One decided to interface its card with Acorn's new *PC Emulator*, Watford Electronics has chosen to design what is effectively a stand-alone PC which can live inside the Archimedes. In other words, Watford's card could have an optional keyboard and monitor attached to it and two people could use a single machine at the same time – one using Risc OS and the other Dos. However, the card is designed to work with Risc OS, complete with a multitasking PC window and access to existing Risc OS hard disc partitions.

Chris Honey says his design route avoids the display limitations of the PC Emulator, which can only partially emulate a full VGA screen. The Watford card will have 256K of video memory for a separate VGA monitor, which will also be able display the Risc OS desktop. 2Mb of system memory will be provided as standard and there is a socket for an optional maths co-processor. Other options include high density (HD) 1.44Mb floppy drives, which are now standard on the new A5000, and an expander to accommodate up to two half-size PC bus expansion cards.

Availability of the Watford card has yet to be confirmed, but managing director Nazir Jessa hinted that pricing would be very competitive with Aleph One's PC cards, which are already on sale. Contact Watford Electronics on (0923) 37774.

NEWS IN BRIEF

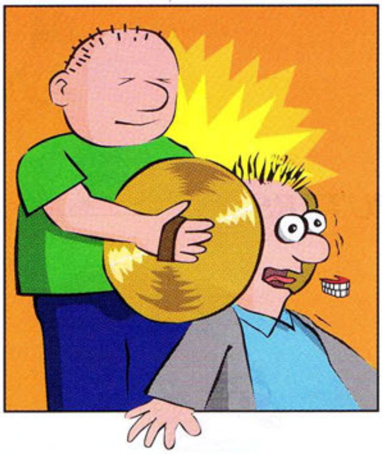
● **THERE** have been some changes in Acorn's marketing personnel line up. Most notable is the arrival of new education marketing manager, Peter Talbot, from Commodore (see education column page 13). Simon Woodward takes on some of departing Warwick Hirst's former responsibilities for valued added solutions, within a new professional solutions operation, covering initiatives such the Professional DTP package.

Consumer division manager Bob Coates takes on wider responsibilities as general manager of consumer and international markets. Corporate affairs manager, Brian Salter, also gets more responsibilities and is now head of publications and events organisation.

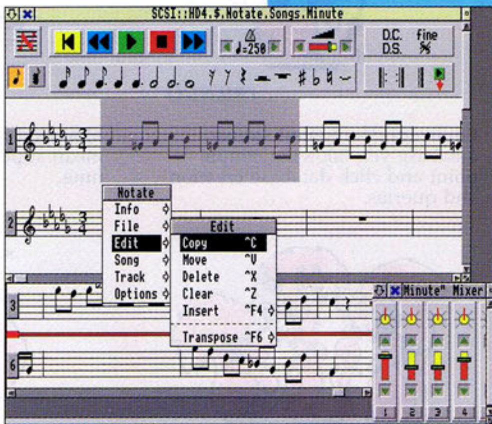
The reshuffle took place after the Computer Shopper Show last December, which was not regarded as a success for Acorn. Although it had a presence at the show, Acorn's stand space was booked late and there was no time to capitalise on its presence.

● **CRADDOCK** Computer Systems (CCS) has revealed that it is designing a modular memory upgrade system which will enable A5000 users to plug in a total of 16Mb of Ram. The upgrade features a motherboard which brings total memory up to 8Mb. This involves de-soldering the A5000's surface-mount Memc1a controller chip, which is why CCS carries out this part of the fitting. Extra 4Mb upgrades, giving a potential maximum of 16Mb, are provided in the form of small 'daughter cards' which plug into the motherboard. Contact CCS on (0604) 760991.

● **HEWLETT-PACKARD** has introduced a double capacity ink-jet cartridge for its Deskjet range of printers. The old version used a sponge to attract the ink to the business end of the cartridge. Ink reservoir space has been saved by eliminating the sponge and the cartridge case is now transparent so you can see clearly when the ink is getting low. The new cartridge has a typical life of about 1,000 A4 sheets. The cartridge is priced at £21 plus VAT.



COMPOSE YOURSELF!



Last week, Miss Brown was in a tangle. Her music class wasn't prepared in time. One group wanted to play the drums, but the music budget barely stretches to a tambourine. Another wanted to write its own music, but it all got rather messy. In the end, she got them all to sing a round song.

This week, Miss Brown is using *Notate*. Now composing music is easy — notes, rests etc. can be placed directly on the screen. Then the music can be played back immediately, and changes made to rhythm, tempo or pitch. When it's done, they're going to print out their piece — a nice neat copy for every musician in the class.

Next week Miss Brown is going to introduce 'Music of the World'. African rhythms, marches, rap, pentatonic scales — *Notate* can do the lot. It's even simple to move individual parts between tunes — ever heard the National anthem with a reggae percussion section?

Notate uses the standard Archimedes 'voices'. The computer can sound like anything from a cow bell to a trombone, from a melodic tom-tom to a hand clap. And up to eight of these 'instruments' can be played at once.

Miss Brown has a sound sampler attached to her Archimedes too, so she can record more of her own instruments. Including the human voice. So now three students are singing a barber shop quartet — the computer is humming the fourth part.

Whether you want to play percussion with seven year olds or think theory with seventeen year olds,
compose yourself — with *Notate*.



Notate

DESIGNED IN THE CLASSROOM
FOR MUSICAL EDUCATION

Notate offers the following features:

- Comprehensive support materials in the manual and on disk
- Up to eight individual staves
- A wide range of synthesised and sampled sounds
- Ability to use accidentals and repeats
- Full range of time and key signatures with control over tempo and volume
- Automatic checking of note length relative to the bar space remaining
- Easy-to-use tape recorder style control panel
- Chord facility
- Mixer controls to adjust stereo balance and volume of all tracks
- Configurable for different levels of musical skill
- Editing facilities which, like word processing, include cut, copy, move and delete within bars, staves or between compositions
- Up to four compositions editable simultaneously
- Ability to transpose single parts or whole compositions
- Export and import of MIDI format 1 files
- Ability to play via MIDI where a suitable interface is fitted.

Notate is available now, priced at £59.

A site licence for Notate costs £190 for a primary school and £330 for a secondary school

LONGMAN LOGOTRON

124 Cambridge Science Park
Milton Road
Cambridge CB4 4ZS

Tel. (0223) 425558
Fax (0223) 425349

SQUIRREL

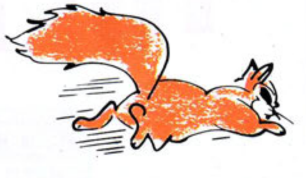
THE REVOLUTIONARY NEW DATABASE FOR ARCHIMEDES COMPUTERS





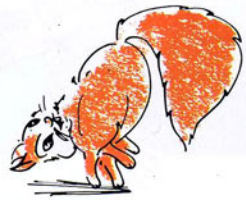
FRIENDLY

Squirrel is the easiest to use database yet, allowing simple point and click database creation and queries.



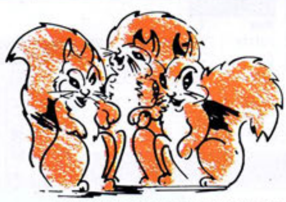
FAST

Modern indexing techniques mean superfast searches every time.



FLEXIBLE

Images, text and sound may be stored in the same database



NETWORK COMPATIBLE

Client/server design ensures that squirrel runs just as well on networks as standalone.



INTELLIGENT

Squirrel understands days of the week, months of the year and recognises files from other popular packages.



COMMUNICATIVE

Queries may be made onto other popular computers such as an IBM or Macintosh, even remotely over telephone lines.



REPORTING

Fully relational reporting with an entirely new graphic approach to data selection.



PROFESSIONAL

Quite simply, the most professional database for Archimedes users.

Single User Version
£129.00 + VAT

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Suitable for Acorn A3000, A310 and A400 Series.

AVAILABLE NOW

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TEL (0705) 210600

BULLETINS ON ECONET

BULLETIN is a new software package from the Scottish-based company XOB, that will allow users to run a bulletin board on Econet-linked A3000/Archimedes machines.

One of the benefits of a computer network is the ability to send electronic messages. But while electronic mail is useful, it does not have the advantages of a bulletin board. With *Bulletin*, individual users may examine messages left by others and reply to them, or initiate discussion on various topics. These can range from examination answers to plans for a school trip.

Messages left on *Bulletin* can be replied to at any time and topics may be open to all users, or restricted to closed user groups.

Bulletin will operate on any Risc OS (A3000, Archimedes, A5000) computer connected to an Econet network. Clicking on the *Bulletin* icon bar will open a window on the first board of messages. The user may then scroll the text up and down and read any messages, each of which has a date stamp, the name of the sender and the intended recipient. Using standard desktop techniques, the user may simply view the topics or contribute their own messages.

Bulletin supports up to 20 simultaneous 'boards' or topics, although it is possible to extend this number if required. All files are encrypted and may only be read by *Bulletin* and a special utility provided for the system manager – this allows closed user groups to be established on less sophisticated file-servers. Those using the SJ Research MDFS have extra levels of security available.

Bulletin costs £67 and is available from XOB, Balkeerie, Angus, DD8 1SR, tel: (0307) 84364.

ROLLING IT

MINERVA Software's *PrimeArt* package can now run rolling displays from pictures produced using the package.

The *PrimeArt Display Kit* utility allows pictures created using the primary art package to be displayed in sequence, making it ideal for classroom demonstrations.

The rolling displays are produced by dropping saved pictures on to the screens directory and clicking on the icon. It costs £12 plus VAT.

Also, a new version of *PrimeArt* has a option for use in high-resolution mode 21. Other new features include support for a Concept Keyboard, options for sticky menus and brush matching.

The new version of *PrimeArt* costs £79.95 plus VAT, including site licence. Existing users can upgrade for £10 plus VAT by returning their original discs. Contact Minerva on (0392) 437756.

BIBLICAL EXPERIENCE

YOUNGSTERS can actually time-travel through biblical events, thanks to a new BBC A3000 audio-visual system. *Bibleworld* is a 20-minute journey put together by the National Bible Society of Scotland in Edinburgh.

It uses six A3000 computers, and has both sound and visual effects. Intrepid young 'time-travellers' can reconstruct a digitised picture from a 'visit' to Israel, test what they have learned from Bible characters, and set out on an adventure in Jerusalem at the time of Christ's birth.

The A3000 is also used by the society in the administration of Bibleworld, which includes keeping track of visitors, as well as developing new programs and ideas. Used in the system is HCCS's Hard Card, *Ovation* and *Impression* DTP software, plus special fonts and graphics.

Contact David Cochrane on 031-337 9701.

PARTNERSHIP FUNDING

TIGHT budgets are not unusual in schools, but at least one school in the Wakefield area has been able to buy a BBC A3000 computer and software, thanks to a partnership between education and local business. Knottingley C of E primary school recently benefitted from a cash injection from Wakefield's Education Business Partnership to buy the equipment. The money was made available to schools and colleges in the Wakefield area in the form of matched funding. Money donated by local industry was matched pound-for-pound by the partnership to enable the school to purchase the equipment.

Karen Rangeley, the partnership manager, and local haulage contractor Eddie Stobart are pictured below with the Knottingley headteacher Janet Taylor and some of her enthusiastic pupils.



The new computer funded by a school-business partnership

NEWS IN BRIEF

● **ACCORDING** to a recent edition of Private Eye, junior education minister Tim Eggar caused some embarrassed giggles when he opened the BETT Show recently. During his tour he was introduced to Acorn's managing director Sam Wauchope and, considerably impressed by the power of the Acorn machines, suggested that it might be a good idea if they were, er, used in our schools. After a short silence, Eggar's guide informed him of Acorn's contribution to educational hardware (found in 85 percent of schools) before moving the minister on.

● **MEANWHILE,** as revealed in our news pages this month, Acorn has finally appointed ex-Commodore man, Peter Talbot, as the new manager of its education division. Talbot, 38, was national sales manager responsible for government and education business at Commodore Business Machines. A former teacher, he also spent a couple of years running Granada Business Centres in London. Acorn's sales and marketing director, Mike O'Riordan, said: 'With Peter's combination of experience of the education market, and of sales and marketing, I am sure he will bring to Acorn a wealth of benefits that will help us to continue our leading role within the education sector.'

● **A MAJOR** step forward in examination administration by schools has been developed using the Archimedes. Over 450 schools will be involved in the project for the submission of exam entries, managed by the University of Cambridge Local Examination Syndicate and Campus 2000, supplier of electronic information services to education. Most of the 'spade work' for the project was carried out on the Archimedes. The software was then ported over to PCs, on which the system will run, although there is the possibility of linking into the UCLES project with an Archimedes machine. Campus 2000 is jointly operated by BT and Times Network Systems, tel: 071-782 7143.

WHOSE LINE IS IT ANYWAY?

HOW many readers skip over the comms column, thinking that it's too complex for them. Maybe they have watched the film *Wargames* and imagine a whole sub-culture of boffins, hacking their way into hidden computer networks.

Well, nowadays it's not quite like that. Comms come into many aspects of life, from the cashpoint machine to ordering in a high street bookstore. At the home computer level, playing online games is a favourite comms pastime.

So, if you are a computer novice, how do you get started? Well all you need is a modem, a computer and some suitable comms software. A modem is simply the box which plugs into your phone line and your computer. It converts your data into strange noises, sends them down the phone line into a modem at the other end, which then converts the strange noises back into computer data.

The comms software is simply a package that lets you choose the data to convert into strange noises, and send them whizzing down the phone line. You can pick up a modem for as little as £50 nowadays and the comms software will cost about the same. To get started, you don't need to worry about speed and all that stuff – most systems that you dial up will adjust their speed to suit your modem. The only thing to remember is that the faster your modem, the cheaper your phone bill will be.

Comms software can often be bought at the same time as your modem but be warned – there are alot to choose from. We will be looking at some over the coming months, to make your choice simpler.

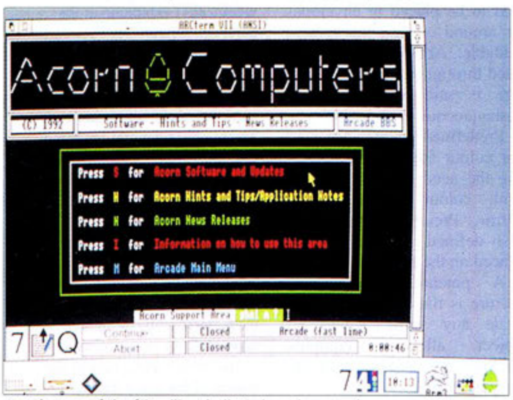
ARCADE IN ACTION

FOR a newcomer, one of the best bulletin boards around has got to be Arcade. Based in Croydon, Arcade is probably the 'definitive' bulletin board for the Archimedes, and contains many celebrity names in the user log, including support from Acorn themselves via a comprehensive Acorn Support area and by a number of Acorn staff who log on regularly. If there is any new PD software or updates to existing software, you can generally be sure that it will go up on Arcade first.

The latest area on Arcade is Virus watch. This is a special area containing all the latest virus killers together with a run down of which viruses each will kill and any relevant information to help keep your discs virus free.

If you're not on Acorn's mailing list, Arcade can also provide any new Acorn press releases, often before the magazines pick them up. A special download section contains text-only files of news stories updated the day they are released.

Arcade is run on a very friendly, club-like basis and users are always ready to help out newcomers, or anyone having problems with their system. In fact, every so often a number of users meet up for a drink, usually around the London area. Arcade are found on 081-654 2212 or 081-655 4412. Set your software to 8N1, ANSI.



Arcade: one of the friendliest bulletin boards around

OUT AND ABOUT

ONE bulletin board that has come to our attention has some rather unusual concerns. Wordsmith BB is designed to appeal to any scribes and other creative folk out there. It seems to be the UK home of writers and photographers and offers many bulletins and forums for budding writers to share ideas and comments.

The sysop is Marcus Harrison, and to contact Wordsmiths, set your software to 8N1 and call 071-603 3302

A completely new BB to try is available on (0795) 471515. Called Pettetts Paradise, it is based in Sittingbourne and run by Graham Pettett. According to Graham, there's lots of messages, lots of games, lots of files and lots of fun! It also supports Fidonet and Worldnet, running at all speeds from 300 baud right up to 14.4k baud. However, this BB is currently only available from 10.00pm to 7.30pm.

The Blackcat BBs, based in Penarth, South Wales is another new BBS to come to our attention. Running at all speeds from V21 up to V42bis and boasting 300Mbytes of online storage it caters for most machine types. If you know of any bulletin boards that you feel deserve our attention, please drop us a line!

Paul Vigay

NEWS IN BRIEF

● If you want a huge selection of PD and Shareware software, with over 2500 programs available, you should try The Shareware BBs on (0424) 830654: (8N1, ANSI, 300/1200/2400/9600 HST). Although it is currently biased towards PC users, Acorn support may increase if lots of users log on. Echomail conferences also support worldwide Netmail and on-line games such as Tradewars.

● Whoops! We would like to correct two errors that crept into our February column. The correct number for Silicon Village should be 081-759 6996. Also the price of the Computer Concepts Fax Pack is £299, not £200 as stated. Apologies to all concerned!

● Have you ever wished you could send Janet mail, via a bulletin board system? Well now you can. Sysop Edward Hobson of The Powerhouse BBS has just set up Janet E-Mail facilities on his board so that you can send messages to friends in universities around the country. The Powerhouse is on (0829) 782676.

● British Telecom has just extended its Telecom Gold system to link into the international Tymnet network. Use of the system will start at the beginning of March and allow access to over 20 countries, including the USA, Japan and most of Europe. For more information, call freephone customer helpline on (0800) 282444.

● Some A5000 users may be experiencing problems when using older style modems. This is because the serial port on the A5000 cannot support split baud rates such as 1200/75. If you want to log on to bulletin boards at this speed, you will need to upgrade to one that will buffer the computer speed for you.

● Ever wanted to run a bulletin board on your Arc but couldn't afford the cost of the software? Carl Declerck has developed the first public domain host system for Arc users. More details in a future column but meanwhile keep an eye out for !RiscBBS on bulletin boards or in PD libraries.

ARCOL DESKTOP

EXPLAN'S *Arcol* graphics package has recently undergone a number of changes. The most important one is the ability to work in any 256 colour mode supported by the Archimedes. Up until now, it only worked in Mode 13 and it was restricted by the rather chunky 320x256 graphics.

The new *Arcol Desktop* installs itself on the menu bar like other Risc OS applications, but switches to full screen when run. A number of new tools have been added and existing ones upgraded and refined. The price is £50 for the single user version and £250 for a site license. Upgrading from the old version of *Arcol* to *Arcol Desktop* will cost £6.50. (All prices exclude VAT.)

For more details, contact Explan UK, St Catherines House, 20 Plymouth Road, Tavistock, Devon, PL19, tel: (0822) 613868.



READER PIC OF THE MONTH

THIS month's special mention should go to S Goreham who at the grand young age of 75 has recently turned his hand to computer graphics. The ship above is one that was produced using a friend's home-grown art package on an A3000 computer. Certainly an inspiring example!

FREEBIE RAY TRACERS

RAY TRACING is becoming increasingly popular among Archimedes users, and many programs are being converted to the 32-bit format. Most of the best ray tracers are in fact in the public domain, a source of quality programs which is often overlooked by the average computer owner.

QRT (Quick Ray Tracer) has been around for some time now and has been responsible for many of the demos circulating on bulletin boards and PD libraries. It is fully Risc OS compatible and runs on the desktop alongside other applications. Pictures are created by describing scenes in special script files, in a similar way to the original *Render Bender* program by Clares.

Output can be in any mode, as a sprite, or as a straight-forward 24-bit clear file which can be displayed to full effect with the PCATS Graphics Enhancer from Serial Port. *MTV*, on the other hand, is also a popular public domain ray tracer and has similar features to *QRT*.

A new addition to the *MTV* pack is PVray which supports a number of advanced features such as texture mapping (taking a scanned image of wood, for example, and using the texture of the wood to provide the surface of an object.)

Both of these programs can be obtained from many public domain libraries (see our public domain feature on page 109 for some general information.) You may also be able to obtain the programs from bulletin boards such as Arcade featured in this month's comms page.

If you know of any other ray tracing programs, or even if have written your own ray tracer for the Arc, don't forget to let us know. Next month, this column will take a quick look at some of the painting packages that are available in the public domain.

Rob Miller

MIDNIGHT EXPRESS

DABHAND computing is to release *Midnight Express* at the end of March 92.

This is a presentation package of the same ilk as *Type-Studio* reviewed last month. *Midnight Express* will allow text to be placed in envelopes or around curves, but remain editable. Arm code has been used throughout, and the package is said to be virtually instantaneous in operation.

Predefined palettes are used for colour adjustment, removing the need to fiddle around with colour sliders, as in *Draw*. Preset envelopes are also defined and they can be placed on the page for editing.

A potentially impressive feature is the ability to tile or scale any sprite within an object, allowing complex backgrounds to be built up very quickly.

For more details, contact Dabhand on 061-766 8423.

NEWS IN BRIEF

● The recent BETT show at the Barbican saw the launch of a new A4, 300 dpi colour scanner. The price is remarkably cheap when compared to the competition, at £799. The German company responsible for the launch, called Cebas can be contacted at Cebas, Landstrasse 21, W-6945 Hirschberg-Grosssachsen, Germany. Tel: 010 49 6201 58130

● Readers of The Guardian's Computer section might have noticed Jack Schofield warming to an Acorn product!

To quote Mr Schofield, 'Acorn Replay was the highlight of last week's BETT exhibition at the Barbican, London.' He goes on to say that 'If anything, Replay looks better than QuickTime on the (Apple) Macintosh.'

Mr Schofield, we couldn't agree with you more! For those who didn't make it to the BETT show, both Replay and QuickTime are software packages that enable moving video to be shown on the desktop, without the need for any additional hardware. Possible uses for such a system include training via multimedia technology using hardware such as compact discs.

To find out more, turn to our review of the Acorn Replay system on page 103.



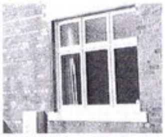
VISION digitiser £49



Time to invest in a Black And White Digitiser.



Available from HCCS at only £49 + VAT. It collects any video signal from a video recorder, CamCorder, LaserDisc Player or Canon Ion etc. and turns it into a standard sprite



window. The high quality visuals enhance



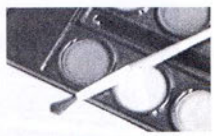
any document; It has Contrast and Brightness controls which can be adjusted before or after the video frame has been captured.



The Vision image size is 640 pixels by 256 lines with 128 effective grey scales using ETT (Error Transfer Technique)



A manual on disc, software and a lead are included in this package. There is a Vision Digitiser to suit any Archimedes. The Vision Black and White Digitiser is in stock now and a colour upgrade



will be available in



June, with a discount to existing users. This document was produced using a BBC A3000 and a Vision Digitiser:

A3000 Internal Vision	£49.00
A3000 External Vision	£62.00
Archimedes Vision (A300,A400,A500,A5000)	£49.00

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PLUS

TALKING TO PCs

The new PC Card from Aleph One will allow your Archimedes to tap into the world of PC software. We check it out

EXTRA MEMORY FOR YOUR A5000

Several companies have produced additional Ram upgrades for the latest Archimedes A5000. We look at what is on offer

PRO SCANNING

We test the latest professional black and white scanner from Computer Concepts – the Scanlight 256

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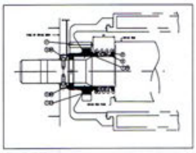
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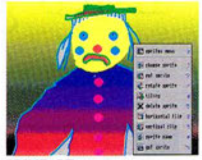
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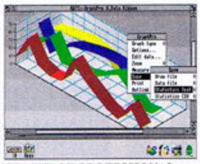
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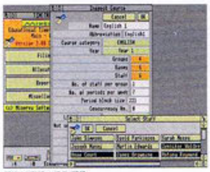
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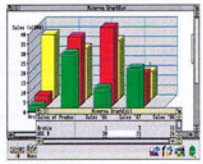
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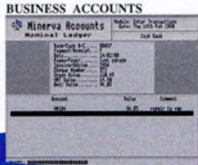


BUSINESS ACCOUNTS

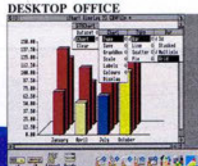


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STAR LETTER £15

I would like to make a suggestion to all hardware and software publishers. I have used a variety of Acorn computers, from the Electron, through the Model B and Master to the BBC A3000. Overall I have found that Acorn has been pretty good in its documentation, as have most third parties. My suggestion is not about the actual text, but the way it is presented.

It seems that there is no standard style in which information is published. Also some software is published in cardboard 'books' which fall apart easily, and in thin cardboard boxes which have no strength at all, leading to a messy shelf.

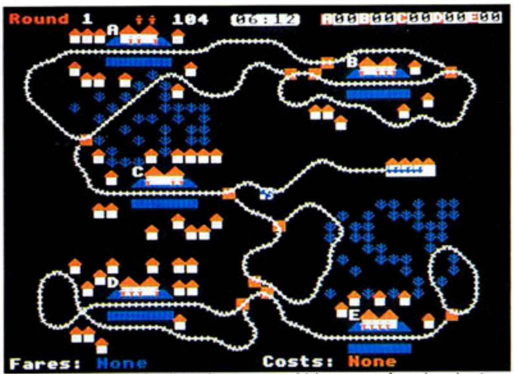
It appears that a lot of Acorn-related merchandise is purchased though mail order, so eye-catching packaging is not really necessary. Why not adopt the simple idea that many computer companies have of using a loose-leaf binder? Computer Concepts DTP package, *Impression*, uses one. Any upgrades to software would only need a few pages, or a file for printing, rather than a new book, or some hastily printed sheets.

Since most DTP software supports various page sizes and formats, it is quite feasible that Public Domain and less expensive software instructions can be provided as text files, which could be printed out if desired. Already a lot of PD software is only documented on disc.

While such a system may not be immediately implemented, I hope publishers think about what they are producing.

Richard Broakes
Dunvant
Swansea

The packaging supplied with *Impression* is perhaps the best example of an updatable manual, although CC does not keep this standard throughout their range. The ideal situation would be for all software to be supplied in a standard box – The Fourth Dimension uses a multi-purpose box for all of its games. The problem with having the entire tutorial on the disc is that unfamiliar users may not know where to start. Many prefer to read the instructions first.



The Train Game – a classic Beeb program which we transferred to the Arc

MODULE MADNESS

As suggested in the article *Hard'N'Easy* (*BAU* March 92), a quick way to update the modules in the System directory in the absence of Sysmerge is to select Full Info from the directory viewer and look at the date stamps of each module. But this method can be hit-and-miss if someone has re-stamped the file with a different date to that of the version date of the module, as I have found out the hard way. I believe Sysmerge also looks at the date stamps – if this is so, then surely it must be used with caution?

The only way to ensure you have the latest modules is to load each one and type `*Help Modules` from the command line, and then have a look at the version number and date. I keep a text file called Versions in my System directory and every time I get a new module I load it and compare it with my version file.

David Madge
London

VIEW TO A KILL

I use *View* quite a lot and I find your Printer Driver Generator extremely useful for my BBC Model B and printer. To increase presentation even further, are there any extensions that can be made to the program so that it can support micro spacing? I would greatly appreciate it if you you tell me if this is possible.

Also, what has happened to your series on classic Beeb programs, *Pieces of Eight*? That was one of the main reasons I purchased the magazine, and I was surprised when the February and March editions did not include it. When is it coming back?

R Keeble
Epsom
Surrey

We felt that Pieces of Eight had served its purpose of revisiting the best eight-bit programs published in the *BAU*. But if anybody has a special request for a specific program, then let us know. But we would also be interested to hear if there are any programs that you would like to see updated or transferred to the Archimedes. Meanwhile, look out for a Pieces of Eight special on View printer drivers.

SECONDHAND HAPPY

I have a BBC A3000 with monitor and 2Mb of memory which I bought along with a monitor stand for £400. Although it was secondhand, it hasn't given me any problems so far.

On the other hand my friend bought an Amiga 500 base unit with a bit of bundled software and 512K of memory for the same price. He then spent another £250 on a monitor and another £65 on a second drive – most of his games were unplayable without one. He would buy a printer, but is scared that it would be incompatible with his software.

So, the Amiga is great for games, but most of them come on two or more discs, take a long time to load and hog the whole machine. Archimedes games are usually fast loading, are desktop friendly in the main (sometimes even multitasking) and disc swaps can be kept to a minimum.

Looking at the graphics side of the Amiga, you do have a lot of colours, but these are only used in ray tracing. Incidentally, has anyone ever heard of outline fonts, or an easy-access version of Basic for the Amiga?

The arguments for the Arc are numerous. I would urge anybody thinking of buying a brand new Amiga to check out the secondhand Arc market before they part with their valuable cash.

A Ashby
Smithills
Bolton

Take a look at our free ads on p85 for secondhand equipment this month.

PRESSING ERROR

I would like to raise a point regarding the review of *ArcFS* and *Spark* (*BAU* February). This review gives the impression that *Spark* and *ArcFS* are public domain programs, or perhaps Shareware. They are not and I would not wish anybody to gain the idea that they are.

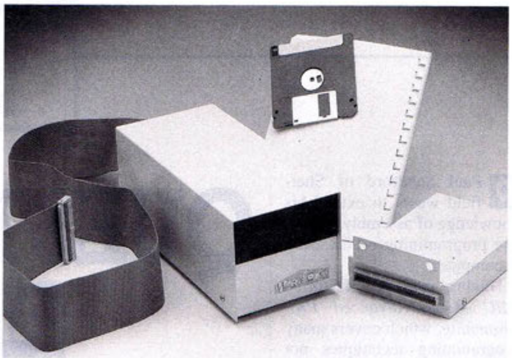
At the end of the review, while the correct information is given about *Compression*, for *ArcFS* it is simply stated that '*ArcFS*... is available from most public domain libraries'. As for *Spark*, there is just the statement: 'Anyone who uses bulletin boards or obtains software from PD libraries is probably familiar with an application called *Spark*'.

Spark and *ArcFS* are not Shareware. They are available from the address below, priced £5.99 each, including postage packaging and VAT.

David Pilling
PO Box 22
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Bits and Bobs

We have managed to procure a selection of useful bits and bobs which would come in useful for people wanting to assemble their own equipment. All equipment is new unless otherwise stated, and cases are typically 'end of line' stock from large manufacturers.

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QUESTIONS AND ANSWERS

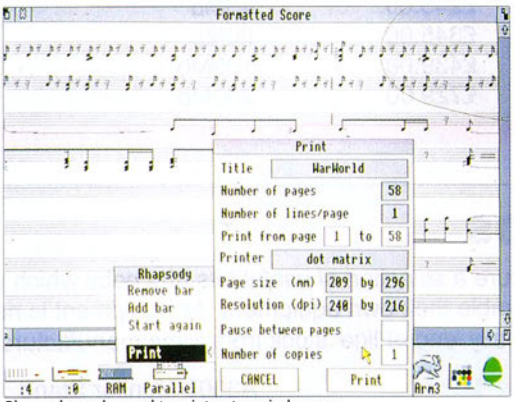
Q Paul Sandford of Sheffield wants to extend his knowledge of assembly language programming on his BBC B computer.

Having read Joe Telford's *BBC Micro Advanced Programming*, which covers many programming techniques not explained in the user guide, he would now like a more advanced book that covers topics such as interrupt handling and writing faster games in machine code.

A There are a number of good books available for the BBC computer, although you could find that many dealers don't hold much stock now, so you may have to hunt around. One to keep a look out for is *Cracking the Code* by Benni Notarianni. It is published by Pan (ISBN 0-330-28666-8) and explains many programming problems such as animated graphics, interrupts, writing maths routines in machine code and how to start writing games. It is aimed at the slightly more competent programmer, although does provide an easy to understand introduction to assembly code programming.

Q A common problem, aired by R Kendall of London is that of saving machine code programs so that they reload and execute at a specific memory location. He asks if there is a way of saving a portion of memory so that it loads at &900 automatically when you reload it.

A The answer to this question depends upon the syntax of the keyword *SAVE when you originally save the object code. Firstly, ensure that you compile your code to assemble at the address you want it to reload it. For example, to get your code to load at &900, set P% to &900 as you compile it and then use the command *SAVE prog 900 A00 90A which will save the portion of memory between 900 and A00, setting the execution address to &90A. When you load and run the program by typing *RUN prog, it will automatically load at &900 and then jump to &90A and start executing the code.



Rhapsody can be used to print out musical scores

Q Teacher, Susan Chapman from the Netherlands is trying to computerise her school library records using an Archimedes computer. She wonders if there is any suitable database software that will allow her to keep book titles, authors, classification numbers and topics, and to update them as required. Another primary consideration is easy use by young children.

A There are a growing number of databases available for the Archimedes range of computers, ranging from traditional style databases which consist of many 'record card' type entries to the more recent 'multimedia' style of database where the entry data can be of a variety of formats including pictures and data from other applications. For your type of use I would recommend *Flexifile* by Minerva Software, (0392) 437756, which is reasonably easy to set up for the data you require. Once set up, young children and old can interrogate the data by using simple icons for forward, backwards and search commands, similar to those on a video recorder.

For more advanced use it will also allow you to create reports and search for entries when you do not know the exact spelling.

Q Problems are often encountered using the outline font system on the Archimedes. David Cooper of Glasgow asks if there is any way to load text into *Draw* with the aim of printing it out using a printer driver.

He repeatedly gets two error messages – either, 'Text area must end with a newline character' or, 'Warning: text area font Trinity.Medium could not be loaded'.

A The first error is reasonably easy to rectify and is usually caused by using *Edit* to compose the original text. When you finish typing your text in, remember to press RETURN at the end of the document, thus leaving a blank line at the bottom. When you subsequently load your saved text back into *Draw*, it will then know where the bottom of the text is.

The second error is caused by *Draw* not being able to find your fonts directory. *Draw* looks for Trinity.Medium by default so you should double click on *Fonts* before you load *Draw*.

Q A quick question next from Freddy Hutton of Oxon. He is currently using *Maestro* in order to compose music on his Archimedes A410/1 but wants to produce a hard copy of his composition on a printer. He asks if there is an application to enable him to do this.

A Your best option here is to upgrade to *Rhapsody* by Clares Micro Supplies, (0606) 48511, which is basically an enhanced version of *Maestro*. As such it will load your existing *Maestro* tunes and convert them to the new *Rhapsody* format. It not only contains support for Risc OS printer drivers, enabling you to print out your finished tune, but also has a host of additional features not supported by *Maestro*. For a professional output you can get an additional package called *Scoredraw* which will produce printed results just like genuine manuscript sheet music.

Q Mr Baker of the West Midlands has just purchased an ATPL sideways Rom/Ram expansion board for his BBC B computer but unfortunately he didn't get any fitting instructions and is now at something of a loss.

A To fit the board, you will first need to remove the cover of your BBC and unplug the keyboard. Next

remove the OS Rom (IC51) and the A/D Converter (IC73, if fitted) and plug them both into the corresponding sockets on the ATPL board. Carefully remove the power connectors adjacent to IC32, bend them at 90 degrees and replace them. Next, remove the shorting link from the lower half of S21 and connect the two flying leads from the ATPL board to the vacant pins, ensuring that the wire marked E1 is to the right. Position the ATPL board pins directly over the empty sockets of IC51 and IC73 and carefully insert the board into the vacated sockets. The machine can now be re-assembled.

If you want to plug Ram chips into socket 15, you can connect a small switch between the contacts of S6, in order to give you a write protect facility.

Q One often voiced question concerns recovery of deleted files on Risc OS discs. Mr G Sheridan of Bedfordshire echos many peoples' thoughts when he admits to accidentally deleting some files from his discs. He wants to know if there is any way of retrieving the lost data.

A **Restoring deleted data can be an arduous task, even for the most experienced of users, so I would recommend a program to automate the task. *Look-Systems* (0603) 764114 have produced just such a utility, which will repair broken directories, restore disc errors and retrieve deleted files. It works on both hard and floppy discs and supports any filing system.**

Q David Hartburn of Tyne & Wear has a problem with his Archimedes internal clock. He finds that it often forgets the time, despite resetting the machine and using *Alarm* to set the clock.

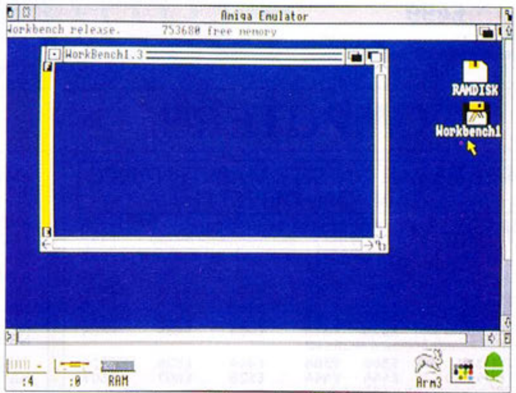
A **This sounds like a symptom of a flat battery inside the computer. Have you noticed any of the computers' other settings becoming corrupted or changed? It is a good policy to replace the Cmos Ram battery every year, as a weak battery can quite often give confusing or unpredictable results during use of your computer. If replacing the battery does not cure the fault, it is possible that you have a faulty clock chip inside the machine, which will need checking by an official dealer.**

Q Another Archimedes disc error is often encountered by M. Dunkin of Lincoln. He reports getting a 'Filecore in Use' error from time to time when using a lot of discs such as DTP, Font and work discs. He asks if there is a simple solution to avoid this.

A **Every time you click on a new disc, its name is added to a list of disc names currently held inside the computer. This is kept until you either turn off the machine or dismount the disc. Unfortunately, Risc OS has a limit, beyond which the 'Filecore in Use' error is generated. The easiest way to avoid this is to dismount discs as you finish using them. Just click the middle mouse button on the disc icon and select the 'dismount' option. It is good practice to remember this and also ensures that you don't have too many filer windows open on the screen.**

Q Mrs Coop of Stroud is the proud new owner of a second hand Acorn Electron, and would like to buy some educational software for her seven year old daughter. However, Mrs Coop only has a cassette recorder and wonders if there is any software available on tape.

A **You can quite often find cassette-based software at bargain computer shows, such as the All Formats Computer Fair that is held every few months at London's Horticultural Halls. However, MicroPower in Leeds still stock quite a few of their educational titles on tape format. You can phone then on (0532) 621111 for a catalogue.**



Whoever heard of Amiga emulation on the Archimedes?

Q A commonly asked question was that posed by D Green of Sunderland. Being a beginner, he asks how to save Basic programs, having just typed them in from listings such as the yellow pages.

A **First, ensure that there is a tape or disc inserted and then, from the Basic prompt type SAVE prog and press RETURN. You can substitute your own program name for the word 'prog', but ensure that it is no longer than seven characters on the BBC or ten characters when using ADFS on the Archimedes.**

When using discs, you can find out what is already on a disc by typing *CAT from the Basic prompt. For Archimedes owners this has the same effect as clicking on the disc icon from the desktop.

Q W Calderbank from Bolton has an Archimedes computer armed with a few games but wonders if there is such a thing as an Amiga emulator in order to extend the range of games available.

A **The Amiga has a very elaborate operating system which would be difficult to emulate with any amount of speed. However, this being the April issue, I was tempted to 'play along' with this one, but the last laugh may be on me, as I have heard that a couple of people are in fact working on one. Arxe systems, 081-534 1198, are actively working on Spectrum and Atari emulators but admit that an Amiga one may be a little bit tricky. Still, you never know!**

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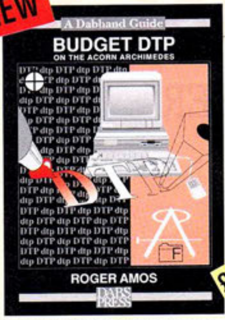
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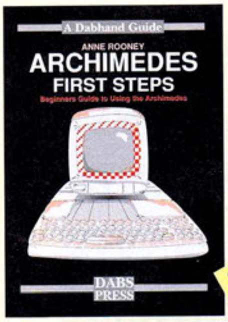
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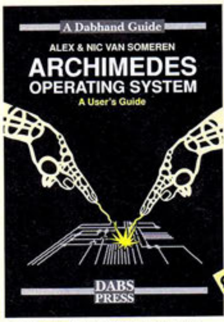
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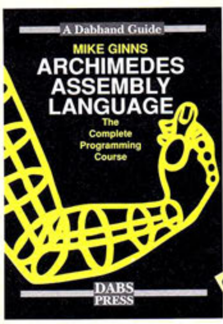
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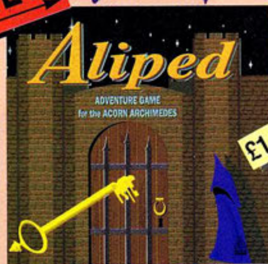
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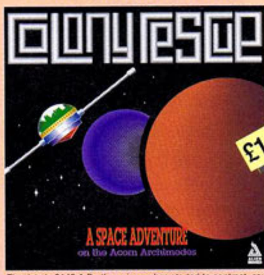
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Viewsheet	**£45**		

Business Graphics

GammaPlot	**£39**	Sigmaplot	**£39**
Interchart Disc	**£17**		

Integrated Packages

- Logistix **£79**
- Pipedream 4 **£149**
- Desktop Office – Database, Graphs & Charts, Wordprocessor Spreadsheet, Communications **£98**
- Desktop Folio – Wordprocessor, Desktop & Interactive Publishing. Ideal for school environment. **£75**

A3000 I/O Card (User, Analogue & IIC)

This NEW versatile I/O Card from Watford, fits inside the A3000 and includes an Analog to Digital Converter, a User Port, and an InterIC (IIC) connector.

The card allows many of the peripherals developed for the BBC to be used with the Archimedes A3000. The ADC and User Port have the same pin out and connectors as the BBC computers.

Extensive RISC OS software is supplied to provide BBC OSBYTE calls for support of the ADC and User Ports, including the BASIC keyword ADVAL. The software provides extended RISC OS support for separate interrupts from both the ADC and User Ports, permitting easy interrupt driven operation.

The card is provided with all the software in ROM and is automatically loaded when the machine is turned on.

Peripherals connected to the ports can obtain up to 500mA of power at +5V. A fuse is fitted to the card to protect the A3000 from damage arising from accidental short circuit of the power output.

The card is provided with an extensive manual explaining installation, all software commands, connector pin outs, hardware addresses and example programs.

Features

- An 8 bit User Port with a standard 20 way IDC connector, compatible with the User Port on the BBC computers and the Archimedes I/O Podule.
- A 10 bit Analog to Digital Converter with a standard 15 way D type connector, compatible with the ADC on the BBC range of computers and the Archimedes I/O podule.
- An InterIC (IIC) Port with a 5 pin DIN socket to connect the A3000 to external IIC devices.

£42

Archi Mouse Port Splitter

Our handy little splitter unit eliminates the risk of damaging your micro due to constant plugging and unplugging of the mouse by allowing you to connect both, a joystick and a mouse simultaneously to your Archimedes. **£15**

Silicon Vision

Gerber Plot	**£95**	Solids Render	**£120**
Solid CAD	**£120**	Solid Tools	**£279**
Super Plot	**£28**	Data Vision	**£110**
Super Dump	**£22**	Share Holder	**£135**
Arc PCB Professional			**£275**
Realtime Solids Modeller			**£136**

Archimedes to BBC Serial Link Mk 2

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers.
New RISC OS Version **Only £15**

Archimedes External Disc Drive Interface

With this interface it is possible to connect almost any 5.25"/3.5" disc drive with its own power supply to the Archimedes. Upto 4 disc drives can be connected. Fully Buffered Board. NO SOLDERING is involved. Supplied complete with necessary lead.

- A300/A3000 **£21**
- A400 **£25**

More Archimedes Products
See Pages 3, 5, 6, 8, 10, 14

LANGUAGES (Archimedes)

ISO-PASCAL; FORTRAN 77			**£77 each**
Assembler; LISP; Prolog X			**£149 each**
ANSI C Rel. 3	**£125**	BASIC Compiler	**£77**
Cambridge Pascal	**£60**	Logotron Logo	**£45**
Macro Assembler	**£40**	Risc Basic	**£120**
Robo Logo	**£69**	Risc FORTH	**£110**

NEW 256 Grey-Scale Scanner

Watford proudly introduces its new innovative 256 grey-level hand scanner for the Archimedes range of micros. It offers up to 400 dpi scanning resolution, complete with software.

256 Grey-Scale Scanner is ideal for incorporating pre-drawn logos, artwork, photographs and sketches into desktop publishing documents and other graphics programs. Designed by our own R & D team, it offers the best overall scanning solution for Archimedes micro. Just compare the competition on our price and these outstanding features:

- Full 105mm 400dpi scanning operation in just 3mS per line! (Twice as fast as most scanners.)
- Selectable 256/16/4 grey levels
- Full scan preview, scale to fit windows
- Complete set of image enhancement tools
- Single width podule
- True brightness and contrast control
- Fast RISC OS printing
- Five-function edge detection software, Laplace convolution matrix image enhancement, image smoothing, etc.

Special Launch Price
£185

ULTIMUM – Archimedes A3000 Podule Racking System



THE ONLY LOGICAL WAY TO EXPAND YOUR A3000 COMPUTER

Price: £149

Minerva's Archimedes Software

EasyWord	**£18**	Mailshot*	**£27**
Home Accounts	**£35**	Reporter*	**£27**
Time Tabler	**£549**	School Admin*	**£65**
System Delta	**£59**		

System Delta Program Reference Manual **£29**
** Requires System Delta to operate*

Stand alone Business Accounts Packages
Sales; Purchase; Order Processing and Invoicing; Nominal; Stock management
£79 per module
or Complete Business Package **£325**

ARM 3 Turbo Card

Simply The Best



Here it is at last – the all new Mark 2 version of Watford's highly acclaimed ARM 3 processor board for the Archimedes and now also the A3000 series computers. Using the latest surface mount technology on a high quality four layer circuit board we have reduced the overall size to a mere 53mm x 45mm, and the cost to only £199. Mk II upgrade will increase the speed of your micro by a factor of 3 to 6.
Any competent A300 or A400/1 series micro owner can fit the upgrade himself, as we provide full fitting instructions and a special ARM chip extraction tool. However for A3000 micros and those not wishing to perform the upgrade themselves, we will collect, upgrade and return your micro by courier service, at an additional cost of £18.
(A300 and old A440 series owners please note – you will need to upgrade to MEMC1A for ARM3 to work.)

RRP £249

Offer Price £185

Acorn have satisfactorily evaluated Watford's ARM 3 upgrade and the A3000 upgrades are fitted by Acorn approved surface mount technology centre, therefore its fitment will not invalidate Acorn's warranty on the micro.

Continued→ → → → → → → → → →

BBC MASTER

MASTER 128K Micro incl. Acorn's View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus FREE OFFER (see below) **£399**

FREE OFFER



A 5.25" Double Sided, 40/80 track switchable 400K Disc Drive complete with cables and a Utilities disc incl. 2 games, plus

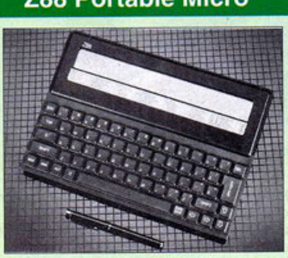
Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control.

FREE with every BBC Master purchased from us during March

Add-Ons & Accessories

Econet Module for the Master	£45
Twin ROM Cartridge for Master	£9
Quad ROM Cartridge for Master	£14
Master Reference Manual I	(No VAT) £14
Master Reference Manual II	(No VAT) £14
Master Advance Ref Manual	(No VAT) £17
64K Upgrade Kit for B+	£32
Acorn 1772 DFS Kit complete	£49
ECONET Upgrade Kit for BBC B	£42
ALL ECONET UPGRADES Available	
ARIES' IEEE Interface for BBC B & Master	£238
Morley Teletext Adaptor with ATS Rom	£99
Ecolink	£270

Z88 Portable Micro



£179

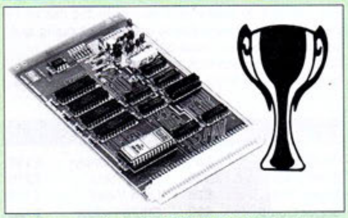
FREE

With every Z88 purchased from us, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

Z88 ACCESSORIES

- 32K RAM Pack or 32K EPROM Pack **£16**
- 128K RAM Pack or 128K EPROM Pack **£32**
- 512K RAM Pack **£86**
- Z88 Eprom Eraser Unit **£38**
- Z88 Spellmaster for Pipedream **£40**
- Z88 Carrying Case **£8**
- Z88 Computing Book **£9.95**
- AA Nicad Rechargeable Battery **£1.50**
- Battery Charger Compact & Fast **£6**
- Z88 Serial Printer Cable **£8**
- Z88 Parallel Printer Cable **£18**
- Z88 to Archi Link **£15**
- Z88 to BBC Link **£8**
- Z88 to PC Link II **£27**
- Z88 to Macintosh **£32**
- Z88 Mains Adaptor **£9**
- Z BASE **£56**
- Z TAPE **£42**
- Z TERM **£42**
- Z88 Modem **£114**

Archi Real-Time Digitiser



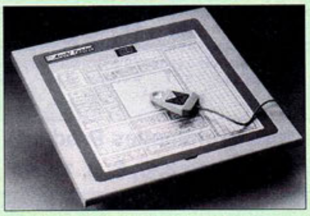
Now supplied with NEW RISC OS Version Software

Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air televison signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £139

A Set of Colour Filters for colour image grabbing using a video camera **£16**

Archi Graphic Tablet



The Archi Graphic Tablet offers performance and accuracy comparable to other tablets priced at well over £400, and has the useful addition of a liftable cover, which can hold tracing material or menu templates securely. The package is supplied complete with sophisticated Archi software. (Now, fully LinCAD compatible. Recommended by Linear Graphic for use in Education).
(FREE this month, PC Mouse Drivers & Art package)

Special Price £175
(Price includes Tablet, Leads, Software & Puck)
Stylus Optional Extra **£15**

Archi Graphic Tablet Junior. Working area 9" x 6". Price includes Stylus **£110**

Disc Plonker Rack



When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk. Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

Protection at Only: £2

Acorn & Watford DFSs

- Watford sophisticated DFS ROM **£16.00**
- Watford DFS Kit complete **£69.00**
- We will exchange your existing ROM for Watford's ultimate DFS ROM at only **£12.00**
- DFS Manual (comprehensive) **£6.95**
- Acorn DNFS ROM **£17.00**
- Acorn ADFS ROM only **£25.00**
- Acorn 1772 DFS ROM Kit **£49.00**

(The single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with the their more up-to-date 1770 DDFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

Watford's MkII 1772

Single/Double Density DFS

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!
If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£39.00.**

- SPECIAL PRICE **£44.00**
- DDFS Manual (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DDFS for only **£30.00**

Please note, as the MkII DDFS is a hardware and sofware upgrade, it is not possible for existing Watford DDFS users to simply exchange the ROM for the new version.

3M – Diskettes

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electonics your 3M Appointed Distributor

- *10 x 5.25" S/S D/D 40T (744)* **£5**
- *10 x 5.25" D/S D/D 40T (745)* **£5**
- *10 x 5.25" S/S D/D 80 Track (746)* **£7**
- *10 x 5.25" D/S D/D 80 Track (747)* **£7**
- *10 x 5.25" 1.6M D/S D/D High Density for IBM XT and AT* **£9**
- *10 x 3.5" S/S D/D 40/80 Track* **£7**
- *10 x 3.5" D/S D/D 40/80 Track* **£7**
- *10 x 3.5" Double Sided High Density* **£13**

Top Quality 3.5" & 5.25" Diskettes

To complement our range of Quality Discs and Disc Drives. WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

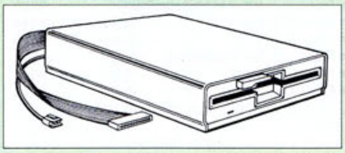
- *10 x **M3** 3.5" D/S D/D 80 Track* **£7**
- *10 x **M9** 3.5" D/S High Density* **£12**
- *10 x **M4** 5.25" S/S D/D 40 Track* **£5**
- *10 x **M5** 5.25" D/S D/D 40 Track* **£5**
- *10 x **M7** 5.25" D/S D/D 80 Track* **£7**
- *10 x **M8** 5.25" D/S H/D Hi-Density* **£9**
- ***M2** 3" Double Sided* ***£2.50 each***

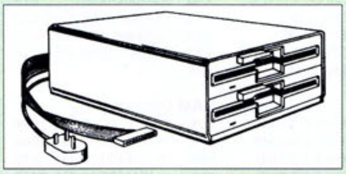
CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 250234 or 233383

Quality Disc Drives from Watford

All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. All 5.25" Disc Drives are 40/80 track switchable. For ease of use, the switches are front mounted.
Various UK "manufacturers" of disc drives for the BBC Micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.
If you look around the popular BBC Micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.
Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. ***Ideal for Schools & Colleges.***
When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space. Your BBC Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double Plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with a Watford plinth. (Turn to the 6th page of our advert for the Plinths).
P.S. All our 5.25" Disc Drives with PSU are compatible with the Compact Micro. All you require is our special Compact Disc Drive cables designed by us.

"Test Bureau Approved for Use in Education"





Our Disc Drives conform to BS415

Type	Description	
	Disc Drive without PSU	
• **CLS400S:**	Single, 40/80 track 400K Double sided Drive	**£70**
• **CLD800S:**	Twin, 40/80 track, 800K Double sided Drives	**£138**
	Disc Drive with PSU	
• **CS400S:**	Single, 40/80 track, 400K Double sided Drive	**£80**
• **CD800S:**	Twin, 40/80 track, 800K Double sided Drives	**£153**

Special Cable to connect both 3.5" and 5.25" Disc Drives simultaneously to the BBC Compact £13

3.5" DISC DRIVE

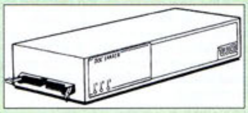


These top quality 3.5" Double sided, 80 track, are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

Type	Description	
	Disc Drive without PSU	
• **CLS35:**	Single Disc Drive, 400K	**£62**
• **CLD400S:**	Twin Disc Drives, 800K	**£109**
	Disc Drive with PSU	
• **CS35:**	Single Disc Drive, 400K	**£83**
• **CD35:**	Twin Disc Drives, 800K	**£126**

(P.S. CS35 is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage)

Disc Drive Sharer



(Ideal for educational establishments)
A low cost alternative to the Econet system.Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC Micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Price includes 3 Cables **£55**

Disc Drives in Monitor Stand



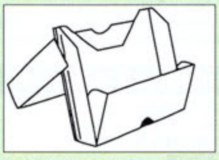
• **CDPM 800S** – Twin 5.25", 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC B & Master 128K micros. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

£165

• **DP35 800** – Same as above except, one disc drive is a 5.25" and the other is 3.5".

£154

Plastic Library Cases



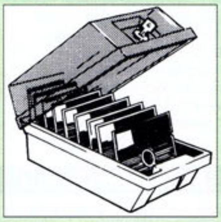
DLC1 –	Holds 5 x 3.5" Discs.	**£1.50**
DLC2 –	Holds 10 x 3.5" Discs.	**£1.90**
DLC3 –	Holds 5 x 5.25" Discs.	**£1.60**
DLC4 –	Holds 10 x 5.25" Discs.	**£2.00**

Floppy Head Cleaner Kit

The heads in floppy drives are precision made and very sensitive to dirt. The use of Cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. it is very simple to use. Available in 3.5" & 5.25", please specify.

Price £4

Antistatic Lockable Disc Storage Units



Gives double protection – Strong plastic case that affords real protection to your discs.
Antistatic helps avoid data corruption whilst in storage. The smoked top locks down.
Dividers and adhesive title strips are supplied for efficient filing of discs.

- **M35** – holds up to 50 5.25" discs **£4.95**
- **M85** – holds up to 95 5.25" discs **£6.95**
- **M25*** – holds up to 25 3.5" discs **£4.95**
- **M50** – holds 50 3.5" discs **£6.50**
- **M100** – holds 100 3.5" discs **£6.99**
- **M10** – holds 8 of No. 10 Data Cartridges **£15**

* Not lockable

Dust Covers (For our Disc Drives)

Single CLS (without PSU)	**£3.20**
Single CS (with PSU)	**£3.25**
Twin CLD (without PSU)	**£3.85**
Twin CD (with PSU)	**£3.90**

Disc Albums

Attractively finished leather-look Vinyl. PVC Vinyl

DW1 – Holds 6 x 3.5" Discs	**£2.50**
DW2 – Holds 6 x 5.25" Discs	**£3.00**
DW3 – Holds 20 x 5.25" Discs	**£3.50**
DW4 – Holds 40 x 3.5" Discs or 5.25" Discs	**£4.50**

Special Bulk Offer on Discs

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

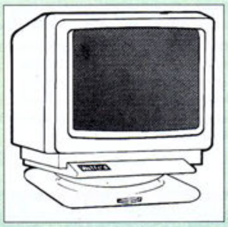


BULK PACK DISCS in lots of 100

Type	S/S 40T	D/S 40T	D/S 80T
• Without Sleeves 5.25"	**£30**	**£35**	**£40**
• With Sleeves 5.25"	**£33**	**£38**	**£43**
• 3.5" D/S D/D	**£27 for 50**		**£49 for 100**

CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 250234 or 233383

Continued→ → → → → → → → → →



Microvitec Monitors

- **1431** – Standard Resolution Monitor £169
- **1451** – Medium Resolution Monitor £209
- **Cub3000** Medium Res for A3000 £189
- **1441** – High Resolution Monitor £359
- Dust Cover for Microvitecs £5.50
- **Touchtec 501 Touch Screen** £239

Now 3 years Parts & Labour warranty on all Microvitec Monitors

Multiscan Colour

Eizo 9060S	£389	NEC 6FG	£1525
Eizo 9070S	£579	Taxan 770LR	£362
NEC 3FG	£370	Taxan 775	£362
NEC 4FG	£465	Taxan 795	£402
NEC 5FG	£850	Taxan 875	£685

- VIDC Enhancer Board £25

(We will supply the Watford's superior Multiscan VIDC Enhancer for Archimedes micro at only £10, if purchased with any Eizo or Taxan monitor.)
(P.S. Taxan 795 monitor is supplied with a FREE VIDC enhancer board)

Aries AlphaScan Monitor

Pound for Pound, the AlphaScan VGA Multiscan monitor provides the maximum performance and greatest flexibility of any 14" colour monitor for the Archimedes micro. Its multiscan circuitry provides automatic adjustment for frequencies between 30 and 60KHz horizontal, and 50 and 90Hz vertical. Its 0.28mm dot pitch high resolution tube provides super sharp text graphics, while a high speed (70/72Hz) refresh rate provides a flicker-free display easing the eye strain. The Multivideo VIDC Adaptor supplied (free) with the monitor allows high resolution operation in all screen modes. **£325**

Philips Monitors

- **BM7502** 12" Hi-res Green Monitor £67
- **CM8833** 14" Med. Res Colour Monitor £167
- Dust Cover for Philips Monitors £6

STAR BUY

- **PHILIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require). **ONLY £166**

Spare Monitor Leads

- **BNC Lead for Zenith or Philips** £3
- Skart Monitor Lead £5
- RGB lead for TAXAN Monitors £3
- Archimedes Colour Monitor Lead £7.50

Anti Glare VDU Screen

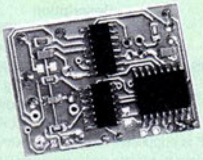
These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for wordprocessor users. **£12**

Aries 2000 Colour Monitor

This attractively finished, etched screen medium res monitor is supplied complete with built-in speaker, volume control and video output. All controls are located on the front panel for ease of use. Ideal for BBC, BBC Master, Archimedes and Amiga.

A bargain at £159

Watford VIDC Enhancer



This unique VIDC add-on board for the Archimedes, caters for all types of Multiscan and VGA monitor and mode requirements. There are 2 versions to suit all requirements. The multimode software supplied, provides all the new modes for the selected monitor type, including the now standard Computer Concepts modes. With VGA monitor, you are no longer restricted to a few modes. A WIMP application supplied on disc, allows new modes to be designed and existing modes to be modified for particular monitors.

Super VGA VIDC Card: This provides support for both VGA and Multisync monitors. A unique electronic design allows the horizontal and vertical sync to be buffered and have the polarity changed under software control **£45**

MultiVideo VIDC Card: As above but for MultiScan monitors only. **£25**

Panasonic Printers



KX-P1123	£129	KX-P1654	*£335
KX-P1124i	£173	KX-P1695	£272
KX-P1170	£100	KX-P2624	*£295
KX-P1624	£272	KX-P2180	£POA

*** Price includes 12 months On-site warranty**

Cut Sheet Feeders

P36 – 1124/24i £79 **P37** – 1123/70/80 £69
P38 – P1624/95; P2624 £129

Buffers

P12 4K Buffer Board for KX-P1081 £55
P14 32K Buffer P1123/24/70/80 P1540/92/95; P1624/54/95 £16

Serial Interfaces

P19 for P1123/24/24i/70/80/1624/54/95/2624 £49

Citizen Printers

120D Plus	£100	Swift 9	£129
124D	£145	Swift 24E#	£249
224	£185	Swift 24X	£299
PN-48	£209	PN48 Ribbon	£4

\# FREE Colour Option with Swift 24E

- Swift 9 Colour Option £19
- Swift 24 Colour Option £29
- Swift 24 Ribbons Black **£4** Colour **£13**
- Citizen/Archimedes Colour Printer Driver £15

Integrex Colour Jet

- Colour Jet 132 Printer £449
- Paper Roll £6.50
- BBC Screen Dump Software £10
- Colour Cartridge £21
- Black Cartridge £12.40
- 100 A4 OHP transparencies £55
- 8K Serial Interface Optional £123
- Colour Jet 2000 £POA

Star Printers

LC15	£173	SJ48 Inkjet	£174
LC20	£100	XB24-200 Colour	£295
LC24-10	£133	XB24-250 Colour	£355
LC24-15	£240	XB24 Colour kit	£29
LC24-200	£164	ZA200 Colour	£234
LC24-200 Colour	£203	ZA250	£297
LC200 Colour	£143		

- Star/Archimedes Colour Printer Driver £15

Star Accessories

Cut Sheet Feeder

LC10/200/24-10 **£65** LC15/LC24-15 **£125**
XB24-10 **£80** XB24-15 **£139**

Serial Interfaces

8K Ser LC-200; LC24-200; FR10; FR15; XB24-10; XB24-15 **£52**

Paper Roll Holders

LC-200; LC24-200; LC24-200 colour **£29**

Buffers

32K Ram Card for LC/XB24-10; 15; LC200 **£55**

Ribbons

LC10; LC10-II; LC15	Black **£4;**	Colour **£6**
LC-200; LC24-200	Black **£5;**	Colour **£12**
XB24-10; XB24-15	Black **£5;**	Colour **£12**

Laser Printers

All Laser Printers include 12 months On-site maintenance

Canon LBP-4+	4ppm	£575
Canon LBP-8 III	8ppm	£970
Canon LBP-8 IIIR	8ppm	£1440
Canon LBP-8 IIIT	8ppm	£1340
Epson EPL4100	6ppm	£620
Epson EPL7500	6ppm	£1159
Epson EPL8100		£965
HP Laserjet IIP+		£625
HP Laserjet III	8ppm	£1015
HP Laserjet IIID	8ppm	£1499
HP Laserjet IIIP	4ppm	£695
HP Laserjet IIIsi	16ppm	£2525
Panasonic KX-P4420	8ppm*	£620
Panasonic KX-P4450i*	11ppm*	£925
Panasonic KX-4455 Postscript	11ppm*	£1450
Panasonic KX-P4430 Satin Print*		£999
Star LP-8 III 2	8ppm	£1249
Star LP-8 III	8ppm	£910
Star LP-8 Star(post)script	8ppm	£1140
Star LP-4	4ppm	£565
Star LP-4PS Postscript	4ppm	£779

* Now with 2 years On-site warranty

Laser Toners

Canon 2, 3 & 4	£46	KX-P4420/50	£19
Epson GQ	£13	Laserjet HP IIP & IIIP	£42
EPL 4100	£59	Laserjet II/D, III/D	£48
EPL7100	£82	Qume Crystal (3)	£58
Star LP-8	£56		

Laser RAM Upgrades

IIP & III 1MB	£51	EPL7100 256K	£39
IIP & III 2MB	£88	GQ5000 512K	£42
II & IID 1MB	£64	KX4420/50 1M	£75
II & IID 2MB	£99	KX4420/50 2M	£115
II & IID 4MB	£146	KX4420/50 4M	£195
Canon LBP4 1M	£105	Star LP8 1M	£139
Canon LBP8 2M	£125	Star LP8 2M	£275

Laser Drum & Developer

Epson Drum GQ5000	£93	EPL7100	£129
Panasonic 4420 Drum	£60	Developer	£59
Panasonic 4450 Drum	£93	Developer	£80
Qume Drum	£76	Developer	£56

Jetpage Postscript Cartridge

- HP IIP/III **£225** IID & IIID **£227**

Various Add-Ons

- Laserjet Appletalk Interface £135
- HP Adobe Postscript £399
- Pacific Page Postscript £259
- HP Premier Font Collection £28
- Laserjet various Font cartridges from £45

Hewlett-Packard Printers

• # Desk Jet 500	£285	• Paintjet XL	£1045
• Desk Jet 500 Col.	£475	• Quiet Jet Plus	£384
• Paint Jet Colour	£430	• HP Think Jet	£265

Now 3 years extended Parts & Labour warranty

- DeskJet 500 Cart. Black **£15;** Colour **£27**
- Paintjet Cartridges Black **£19;** Colour **£25**
- Desk Jet 500 256K RAM cartridge **£99**
- HP Epson FX Emulation Cartridge for Desk Jet **£59**
- Desk Jet Unlimited (Book No VAT) **£19.75**

Canon Bubblejet Printers

	Printer	CSF	D'ble Bin	Ink Cart
BJ10EX	£183	£43		£16
BJ300	£289	£88	£65	£12
BJ330	£380	£110	£79	£12
BJC800C	£1549			

- Spare Battery pack for BJ10E **£33**

NEC Pinwriter Printers

• P20	£180	• P70	£419
• P30	£240	• P90	£635
• P60	£330		

- P60/70 Colour Option Kit **£59**
- Ribbons Black for P20/30 **£6** for P60/70/90 **£7**
- Ribbons for P60/70/90 Black **£9** Colour **£13.50**

Cut Sheet Feeders

P20 **£59;** P30 **£85;** P60 **£89;** P70/90 **£80**

Epson Printers

DFX5000	£1079	LQ1060 Colour	£595
DFX8000	£1979	LQ1070	£315
FX850	£264	LQ1170	£437
FX1050	£336	LQ2550+	£675
LQ100	£159	LX400	£101
LQ200	£162	LX850+	£140
LQ450	£165	LX1050	£206
LQ570	£205	SQ850	£432
LQ860 Colour	£444	SQ2550	£625
LQ870	£368		

Cut Sheet Feeders for

LX400/800/850/LQ400/500/550 **£69**
EX800/FX800/850/LQ800/850 **£130**
FX/LQ 1000/1050/SQ850 **£159**
LQ 2550 **£390** SQ2550 **£390**

Tractor Feed for

LQ800 **£44;** LQ850/FX850 **£69;** LQ1050/FX1050 **£85;** LQ2500 **£90;** LQ2550 **£90.**

Accessories

- EX800/1000 Colour Option **£45**
- EX800/1000 Colour Ribbon **£14**
- LQ2500 Colour Option **£65**
- Multifont Card for LQ550/850/1050 **£95**

Epson Printer Interfaces

All these interfaces fit inside the printer

RS232 **£28** RS232 + 2K Buffer **£52**

Printer Leads

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Nimbus Centronics Lead	£6
IBM/Archimedes Parallel Lead 6'	£4
IBM/Archimedes Parallel Lead 5 metres	£10
IBM/Archimedes Parallel Lead 10 metres	£15
Double Ended 36 way Centronics Lead 4'	£7
Double Ended 36 way Centronics Lead 6'	£9
MSX Centronics Parallel Lead 4'	£12
RS232 Leads (Various)	P.O.A.
IBM Keyboard extension lead coiled	£5

Concept Keyboards

Standard A3 Keyboard with BBC Software	£138
Standard A4 Keyboard with BBC Software	£109
Archi A3 Keyboard	£139
Archi A4 Keyboard	£110

Plotters

• HP7440AU	£525	• HP7475AU	£715

Roland Plotters

• DXY1100	£490	• DXY1200	£620
• DXY1300	£825	• DXY2500	£2345
• DXY3500	£2955	• Sketchmate	£310

- Roland plotter Pens, Fibre tip **£7.50**

Listing Paper (Perforated)

- 1,000 Sheets 9.5" x 11" Fanfold Paper **£7**
- 2,000 Sheets 9.5" x 11" Fanfold Paper **£11**
- 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold **£21**
- 1,000 Sheets 15" x 11" Fanfold Paper **£9**
- 2,000 Sheets 15" x 11" Fanfold Paper **£16**
- 1,000 Sheets true A4 Fanfold Paper 70gms **£11**
- 2,000 Sheets true A4 Fanfold Paper 70gms **£21**
- Teleprinter Roll (Econo paper) **£4**

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50, 2K Sheets £3.00

Printer Labels

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£6.00
1,000 90 x 36mm (Twin Row)	£6.25
1,000 90 x 49mm (Twin Row)	£7.50
1,000 102 x 36mm (Twin Row)	£6.75

Laser Printer Labels on A4 Sheets

3750 70 x 29mm (3 Rows)	£13.50
3000 70 x 37mm (3 Rows)	£13.25
2625 70 x 42mm (3 Rows)	£13.00

Printer Ribbons & Various Dust Covers

Type	Ribbons	Dust Covers
BBC Micro	–	£3.50
BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
Citizen 120D	£2.75	£4.50
DMP2000	£2.75	£4.75
DMP4000	£3.75	£4.85
EX800/1000	£3.50	£5.00
RX/FX80/85/800/MX80	£2.95	–
FX/MX/RX100/1000	£3.95	–
Kaga/Taxan KP810/815	£3.25	£5.00
LQ400/500/550/800/850	£3.25	£6.00
LQ1050/LQ2500	£4.00	–
LX80/86/800/850	£2.75	£4.50
LX400	£3.50	£5.00
M1009/GLP	£2.95	£3.75
NEC P2200	£4.50	£5.00
Panasonic KX1080/81	£3.25	£4.75
Panasonic KX-P1124	£7.00	£5.00
Star LC24-10	£2.95	£6.00
Olivetti Ink Jet Cartridges (set of 4)	£6	

Original Panasonic Ribbons

Guaranteed to last 3 million characters

P110 for KX-P1081, 1592 & 1595 **£6**
P115 for KX-P1180 **£7** **P145** for KX-P1124 **£7**
P140 for KX-P1540 **£8** **P155** for KX-P1624 **£8**

Colour Ribbons for KX-P1081, 1592 & 1595 Brown, Blue or Red **£9 each**

Professional Printer Stand



The professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Its ergonomic design ensures smooth paper flow and automatic refolding.

80 Column version £24 (carr. £3)
132 Column version £29(carr. £4)

Universal Printer Sharers/Changer

Connect up to 5 Micros to 1 printer or 5 printers to 1 Micro with our combined, Sharer/Changer switch boxes.

Standard Low Cost Type

Connects	Serial	Parallel
• 2 to 1	£10	£11
• 3 to 1	£13	£14
• 4 to 1	£16	£17

Professional Type

Connects	Serial	Parallel
• 2 to 1	£17	£18
• 3 to 1	£22	£25
• 5 to 1	£34	£38

Cables extra at £6 each

2 Way Compact Printer Switch

A handy 2 way printer switch can be attached to the micro or monitor for ease of use.

• Centronics **£18;** • Serial **£17**
(Cables extra at £6 each)

Auto Printer Sharer Switch

Connects	Serial	Parallel
2 to 1	£40	£45
4 to 1	£62	£49
8 to 1	–	£89

256k Multi Spooler

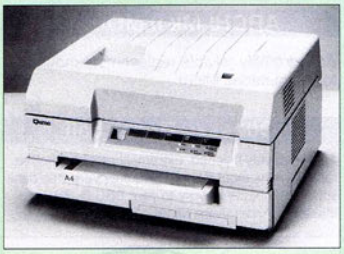
These Auto Parallel Printer Sharers have built-in 256K of Printer Buffers. They can be used as Auto Sharers, Printer Buffers or both.

• 2 In/2 out	£135	• 4 In/2 out	£169
• 8 In/1 out	£199		

Compact Converter Units

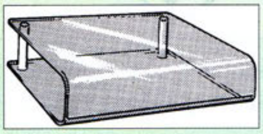
Serial to Parallel **£36** Parallel to Serial **£37**

Laser Direct



- Laser Direct Qume 6ppm complete **£749**
- Special High Res Card 600 DPI for Canon LPB 4 & LPB 8 Laser Printers **£315**
- LPB 4 Printer plus High Res Card **£875**
- LPB 8III Printer plus High Res Card **£1275**

Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand.

80 Column version **£16** (carr £3)
136 Column version **£20** (carr £4)

Continued→ → → → → → → → →

QUEST MOUSE Mk III

- Quest Mouse III & Quest Paint **£59**
- Quest Mouse III, Quest Paint, AMX Stop Press & Pagefont **£89**
- Quest Mouse III only **£30**
- Quest Paint Software only **£34**
- Quest Font Disc (22 Text Fonts) **£15**
- Quest Mouse Mat (Red or Blue or Green please specify) **£3**
- Quest Colour Dump Disc – This new software allows you to print direct from Quest Paint to your Integrex Colour Printer **£18**

(P.S. Quest Paint is not compatible with BBC Compact)

Quest Paint is the winner of the BBC Acorn User 1990 Award for the Best Art/Graphics software

ConQuest

Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

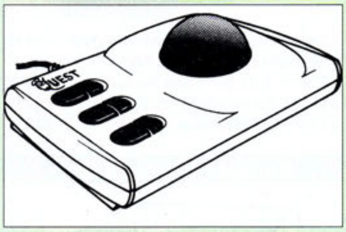
ConQuest ROM Package **£30**
(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)

ARCHI Mk II MOUSE

An extremely reliable replacement mouse for Archimedes Micro **£32**

Quest – Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.



QT-10 BBC/Master Version **£25**

QT-20 Archimedes Version **£26**

RB2 Marconi TRACKER BALL

RB2 (AMX/Quest compatible)	**£36**
RB2 including Quest Paint	**£69**
RB2-A for Archimedes	**£37**

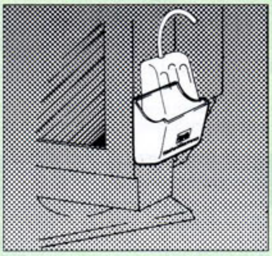
THE NEW Mk III AMX MOUSE

- **AMX Mouse plus Super Art** **£54**

(Please specify for BBC, Master or Compact)

- AMX MOUSE ONLY **£29**
- AMX SUPERART Package **£29**
- AMX STOP PRESS – A Desktop publishing software. Works with Keyboard, Joystick or a mouse **£25**
- PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker **£13**
- AMX DESIGN (ROM) **£34**
- AMX XAM Educational **£15**
- AMX EXTRA EXTRA **£16**
- AMX MAX A gem of desktop (ROM) **£20**
- MOUSE MAT **£3**

WE Mouse House

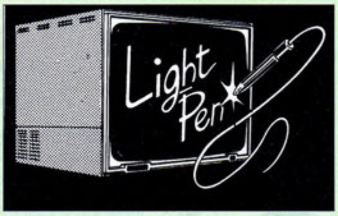


Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, monitor, disc drive or desk.
It protects it from damage when not in use, yet within easy reach when you need it again. At £4 it does not cost a rodent's ransom.

Price £3

Mouse Cleaning Kit

To obtain trouble free operation and prolong the life of your mouse, it requires regular cleaning. Our deluxe mouse cleaning kit is ideal for the purpose **£3**



Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted. (Price includes FREE software Disc and Operating Manual)

Only £19

BEEB VIDEO DIGITISER



"Test Bureau Approved for Use in Education"

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro. This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket. The software supplied includes a sophisticated, fast screen dump routine.
Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem. The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

£99

(BBC B+ and Master compatible, except Master with Econet)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)

Beeb Hand Scanner

Hand-held Scanner for the BBC Micro



Watford Electronics are pleased to announce the launch of the first hand held scanner for the BBC Micro. HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs! These useful devices have been available for faster and more expensive micros for some time, but only now is Watford Electronics able to offer the BBC Micro computer.

The HandScan plugs directly into the 1MHz bus on the BBC while a comprehensive set of utilities provided by the sophisticated ROM firmware. The scanner has a resolution of either 100 DPI or 200 DPI when accuracy is essential. Pictures as wide as 4" may be scanned in mode 0 and various types of dithering may be selected to simulate the grey levels of a scanned picture.

All necessary software has been included in the firmware to allow the scanner to read images directly into our Wapping Editor with little more than the click of the mouse. The digitised picture may then be incorporated into your magazine, newsletter, report or any other document.

Beeb HandScan & Firmware **£115**



Winner of the BBC Acorn User 1990 Award for the Best DTP/Word Processor

The Wapping Editor

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantage of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Included with the system is a utility disc containing several high quality fonts, various utilities and a ROM image of a Support ROM. A comprehensive 100 page manual completes the package. The Support ROM contains routines to allow an area to be rotated to any angle or distorted to any four-sided shape. Also included are facilities to draw ellipses at any angle and sectors, segments and arcs (in Master or BBC B with Acorn GXR). Another of the features of the Support ROM is a 'Turbo DFS' which gives DFS access times comparable with those of ADFS.

Page Layout Section

The Wapping Editor may be used to create pages of any size from an A6 to a full A3 page. If none of the eight default page types suit your purpose, the stand-alone page creation program may be used to create pages to your own requirements. By using proportionally spaced fonts and genuine microspacing it is possible to print over 150 characters across an A4 page. A unique feature of the Wapping Editor is the 'A5 x 2' page size allowing two A5 pages to be printed side by side onto a single A4 sheet.

The graphics module incorporates the facilities like: pencil, brush, airbrush, polygon, circle, eclipse, fill, cut & paste, etc.

Text may be typeset, either justified or unjustified, in any font anywhere on the page. Simply select which font and text document you wish to use, and pull out a rectangle on the page where you want the text to be – it's as simple as that! Multiple columns may be printed just as easily and a special 'expand' feature may be used to expand the microspacing so that the document exactly fits the space defined.

Word-Processor

The integral word processor is the ideal tool for producing your text documents, although text can of course be read in from any of the other popular word processors such as View, Wordwise etc.

The Font Editor

The font editor module will allow you to design your own typefaces or to modify the ones provided on the utility disc. This sophisticated editor has numerous functions designed to take the tedium and frustration out of producing good looking, well balanced fonts. Each character may be individually proportionally spaced and characters of any size up to 16 x 16 pixels may be defined.
Pictures may also be 'grabbed' from a video source by using the Watford BEEB Video Digitiser.

Wapping Editor Software Pack	**£59**
Wapping Editor plus Mouse	**£79**

(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games etc.
Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out.

Music writing symbols in the form of pattern and brush for quick production of manuscripts are included together with staves.

There are two prepared hi-res pages layed out for printing labels, both single and double width. Ready made label designs are included but these can be easily replaced with your own designs.

A Mode 0 screen dump routine is also included. To pack such a large amount of data onto the discs the screens have been compressed and routines to compress and expand Mode 0 screens are included on both discs. Using the packing routine you can archive large numbers of screens onto a single disc.

£15

Wapping Font Disc 1

Sixteen additional fonts, including smaller version of Oberon and Daisy and two new sizes of the standard font for the Wapping editor.
Also included are three Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines.
Supplied complete with instructions. **£12**

Wapping Font Disc 2

This new addition to our Wapping range of DTP software provides you with additional 23 fonts for the Wapping Editor DTP pack. (80 track discs only). **£13**

Archi A4 Scanner



This most advanced Archi A4 image scanner is supplied complete with ROM based podule software. Features provided include facilities for zooming in on an image and inverting the image in X and Y directions, saving and printing of the sprite created. Interactive help is supplied using the !HELP application on the Acorn applications discs. The 216mm scanning width can cope with both desktop scanning of single sheets, photographs, diagrams, etc., with its fast ten page automatic document feeder, but it can also detach from the feeder to become a convenient hand-held full page scanner for larger documents or pictures.
Scanned image control can be freely adjusted in increments of 10 dots per inch from 100 up to 400 dpi resolution with 64 levels of grey scaling. A built in shading controller and manual brightness control achieve optimum image clarity.
Unlike some scanners, which use a red light source, the Watford scanner uses a yellow/green source which vastly improves the light/dark contrast, thus eliminating the effect where any red-based colours are faded down to white and so do not show up in the scanned image.
All these features and facilities combine to make the Archi Page Scanner the fast and convenient way in which to add that extra impact, interest and clarity to documents, reports, instruction sheets, manuals, news letters, etc., from your Archimedes DTP package.

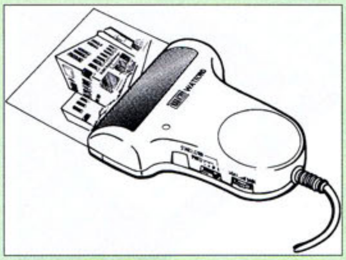
New Low Prices:

Archi A4 Scanner	£269
Sheet Feeder for above	£75
Scanner + Sheet Feeder	£359

Computer Concept Scanlight

• Scan-Light A4	£275
• Scan-Light A4 + Sheet Feeder	£368
• Scan-Light Junior mono	£130
• Scan-Light Junior 256	£197

Archi Mk II Hand Scanner



Watford Electronics is now able to offer a complete hand held scanning package, possibly the most essential addition to any desk top publishing system, for only £149. The package includes the most comprehensive utility software available for the Archimedes, a high quality hand held scanner, and all necessary documentation to get you going straight away.

SCANNER

The scanner is capable of scanning up to an amazing 400 dots per inch (DPI)! The scanning area is 4" wide, and the height is only limited by the maximum amount of memory available. The dot resolution may be switched to 100, 200, 300 or the maximum 400 dpi. One of four operating modes may be selected offering either pure monochrome scanning, or one of three grey level modes. The grey level modes use different size dither patterns to represent up to 16 shades of grey. There is also a dial to allow the "brightness" to be adjusted over a wide range, in order to optimise the quality for any specific image. The scanner interface is a standard, single width, expansion card (podule) which plugs into the Archimedes' backplane. The socket on the rear panel connects the scanner by 1.8 metres of cable.

SCANNER SOFTWARE

Full use is made of the windowing and the multi-tasking facilities of RiscOS. The software is supplied in a 64Kbyte ROM located on the interface board. The scanner appears as a small icon on the desktop icon bar, and the software is retrieved from the ROM simply by clicking on that icon. As you scan a page, the image appears in the scanning window on the screen, scrolling up in real time. The other facilities included in the software are.

Cropping and scaling to any size including stretching and squashing in X and Y direction separately.

Colour tinting.
X and Y flip.

Edge detection which turns solid objects into outlines.

Selective directional copying which allows features (i.e. lines or text) to be made thicker or thinner.

Scanned images may be saved as sprite files or transferred directly into other RiscOS applications (DTP, Draw, Paint) simply by dragging the sprite file into the application's window. Sprites may also be generated using anti-aliasing. This greatly improves picture quality and is particularly effective when scanning material with a range of grey tones, such as photographs. Images can be printed on any printer that is supported by a RiscOS printer driver, with optional settings for portrait or landscape modes, image scale and positioning. Images are printed using the full resolution of the printer and are not limited to the screen resolution.

On-screen help is provided via the RiscOS interactive help facility. Calls are also provided in the ROM for users wishing to write their own software, incorporating the use of the scanner.

AHS-4 Archi 300/400 Version	**£119**
AHS-3 Archi A3000 Version	**£129**

Continued→ → → → → → → → →

Sideways ROM ZIF Socket System



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for professionals and Hobbyists alike.)
- BBC, B and B+ compatible.

ONLY £18

BBC B Low Profile Cartridge System

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

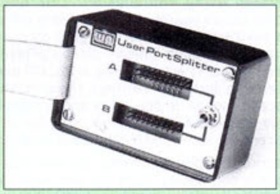
• Complete System	£11
• Spare Cartridges	£2.75
• Spare Rack	£1.65

ROM Cartridges for the BBC Master

Will also accept the new larger Piggy Back ROMs like: Interword, Interbase, Quest, Conquest, etc

Twin **£8;** Quad **£13**

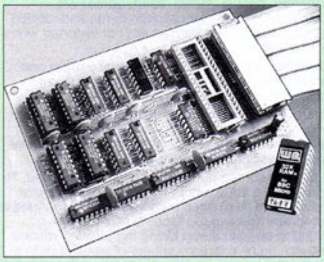
User Port Splitter Unit



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination

Excellent Value at **£22**

32K Shadow RAM/Printer Buffer Card Expansion Board



A MUST FOR WORD PROCESSING

Simply plug the ribbon cable plug into the 6502 socket and gain a massive 32K of extra RAM.

- While word processing, you don't wait for a slow printer, type in text while printing and save on expensive printer buffers.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28K bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24k of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20k of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28k of program space.
- Use the full 32k or the bottom 12K of the expansion RAM as a printer Buffer. (P.S. Only 12K printer buffer can be used with Wordwise & WW+, due to the way they are written).
- Unique facility to turn ROMs off and on again.

Only £54

(Price includes a comprehensive manual and the ROM)

NEW

Commander Joystick



Watford Electronics' new Commander Joystick for the BBC B and Master 128K has a unique dual mode of operation giving selective free floating or self centring fully variable control in both X and Y axis directions. Commander is particularly good for flight simulation and drawing programs.

Features:

- Direct connection to BBC Analogue input port – no interface needed.
- Fully compatible with all BBC Joystick controlled games programmes.
- Switchable springs allow selection of floating or centring operation.
- Trim adjusters for both X and Y axes for fine centre adjustment.
- Convenient stick mounted fire button with additional base buttons.

Price: £15

ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Cobal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved ★FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on you BBC micro – no flying leads to connect and no soldering. Provision of the onboard ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£59**

Aries B-12 Sideways ROM Board

The B-12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost

Price:	Aries B-12	**£36**
	Aries B-12C	**£5**

Aries B-488 IEEE-488 Interface Unit

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB or 'HP IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238

Voltmace Joysticks

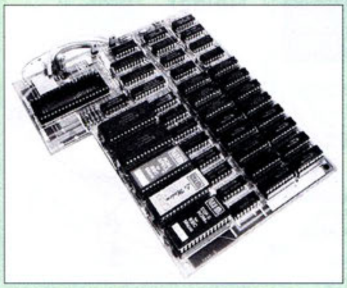
Delta 3B Single Joystick	£10
Delta 3B Twin Joysticks	£15
Delta 3C Joystick for Compact	£10
Delta 14B Single Joystick	£11
Delta 14B/1 Adaptor Module	£12
Transfer Software Disc-Tape	£7
Delta-Cat A mouse eliminator Joystick for the Archimedes	£24

Delta Base B



Analogue aircraft style yoke Joystick to run in the analogue port of the BBC B & Master 128 — £25

ROM/RAM Card



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 9 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, Watford's ROM/RAM card.

- NO SOLDERING required to fit the board.
- NO User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Compatible with BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROMSPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

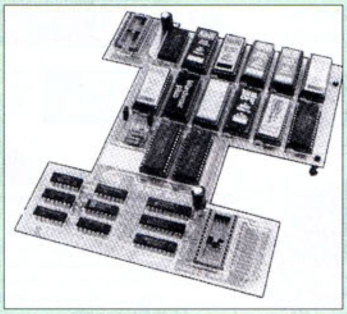
PRICES:

- ROM/RAM card with 32k DRAM £45
- ROM/RAM card with 64k DRAM £59
- ROM/RAM card with a massive 128k DRAM £99

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit £8
- 16k DRAM for Upgrade £13
- Battery backup £3
- Read and Write protect switches £2 each
- Complete ROM-RAM card with all options fitted £109

Solderless Sideways ROM Socket Board



The key features of this no fuss, easy to install card are:

- Increases your BBC Micro's ROM capacity from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £35
Battery Backup fitted **£39**
Battery Backup only **£3**
16K Sideways RAM **£8**

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer. **Only: £8**

BBC Educational Software

- Maths with a Story 1 (Disc). 4 primary level maths programs £20.00
- Maths with a Story 2 (Disc). 4 further maths programs. £20.00
- Picture Craft (Disc) 6-14 age group. Pack consists of flexible geometrical design & colouring programs. £17.00
- ECOLOGY O-Level program. £20.00
- POLYMERS O-Level program. £20.00
- Classification & Periodic Table O-Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. £20.00
- ADVANCED TELETEXT SYSTEM £8.65
- PERIOD TABLE SOFTWARE £20.00
- Computers at Work – Primary £17.35
- Electric Fields 6-14 years £11.25
- Espana Viva – 3 Discs £19.95
- WHITE KNIGHT Chess game £16.00
- A Vous La France £29.00
- **FUN SCHOOL 2 – Red:** Under 6 yrs £12.00
- **FUN SCHOOL 2 – Green:** 6-8 yrs £12.25
- **FUN SCHOOL 2 – Blue:** 8 yrs+ . £12.50
- **FUN SCHOOL 3 – Red** £18.50
- **FUN SCHOOL 3 – Green** £18.50
- **FUN SCHOOL 3 – Blue** £18.50
- Six French Games – Aimed at pupils in their first year of French, but also useful as revision for more advanced students 11 years+ £26
- More French Games – Another 6 games 12 years+ £26
- Au Restaurant and Accident de Route 12 years+ £26
- Boulogne and Oh-Les – 2 programs for beginners £26
- Letters to French Penpals – 11 years+ £26
- French Programs with Henri Beret – The programs in this series present vocabulary, grammar and role-play phrases in the form of animated games. 11-16 £22
- Six German Games – Aimed at pupils in their first year, but useful as revision for more advanced student of German. 12 years+ £22
- More German Games – Aimed at pupils in their 2nd year of learning German. 12 years+ £22
- The Cloze Program – Using context clues to predict is much more than a gap filling exercise. All ages £26
- An Introduction to Electronics – Brings together all the basic electronics required for a GCSE Physics or CDT course. 14-16 years £26
- Computer Control – This is a package of 3 programs simulating control of a greenhouse, a robotic arm & a chemical plant. 14-16 years £26
- The Nuclear Reactor – An interactive, menu driven program for GCSE pupils. Demonstrates & explains nuclear fission & the chain reaction. 14-16 years £22
- PUNCMAN Learning punctuation
  Puncman 1 & 2 for 7 – 13 years £15
  Puncman 3 & 4 for 8 – 14 years £15
  Puncman 5 & 6 for 8 – 15 years £15
- Yes Chancellor – A chance to take over number 11 at Downing Street. 12 years+ £18
- Letters & Pictures – Introduces phonic skills to Infants 6-8 years £15
- Numbers & Pictures – Early number learning is a great fun (4-6 years) £15
- Note Invaders – Budding musicians can learn the notes on the Clef with this elegant game 3 programs (7 to Adults) £15
- Maps & landscapes No. 1 (9-14 years) £18
- Help Your Child learn Basic Map work No. 2 (9-14 years) £18
- Pirate – Educational Adventure (8-14 years) £15
- Spelling Week by Week (6-14 years) £18

Archimedes Software

- Animated Alphabet (3-6 yrs) £21
- Arcventure (8-12 yrs) £29
- Bookbinder £43
- Bumper Disc £14
- Bumper Disc 2 £14
- Craftshop 1 £26
- Craftshop 2 £26
- Christmas Allsorts – Clip Art (6-16 yrs) £16
- Converta-Key £16
- Data Word £16
- Desktop Stories £35
- DigiSim £35
- Dream Time (5-7 yrs) £23
- Droom £19
- Farm (5-7 yrs) £19
- Fleet Street Phantom (9-13 yrs) £25
- Fun School 2A Red (up to 6 years) £12
- Fun School 2A Green (6-8 years) £14
- Fun School 2A Blue (8 years +) £14
- Gate Array Teaching System £68
- Glimpse Clip Art Utility (7-16 yrs) £8
- Highlighter (6-16 yrs) £42
- Jiglet £27
- Jigsaw £28
- Mapventure (9-13 yrs) £24
- Microbugs £24
- Money Matters £16
- Nature Park Adventure (7-9 yrs) £27
- Numerator £60
- Picture Book £16
- Recall (6-13 yrs) £39
- Sellardore Tales £24
- Snippet £26
- Space Mission Mada (9-13 yrs) –
- Sting of the Dump (9-13 yrs) £22
- Target Maths £16
- Viewpoints (9-12 yrs) £33
- Wizard's Revenge (7-10 yrs) £17
- Worst Witch (7-10 yrs) £25

Continued→ → → → → → → → → →

Computer Concept's ROMS

Communicator	£49
Disc Doctor	£18
Inter BASE	£49
Inter CHART	£25
Inter SHEET	£37
Inter WORD	£36
Mega-3 ROM	£76
Spell Master	£42
Wordwise	£24

Wordwise plus

£40

We are giving away absolutely **FREE,** the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear test-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc interface in your Micro)

Acorn ROMS

View 3.0 ROM	£45
Viewsheet (Acornsoft)	£36
Viewstore	£36
Viewspell with 80 track disc	£25
Viewplot Disc	£20
(Please specify for Master 128 or Compact)	
View-Index	£12
Overview packs 1 & 2	£65
Hi-View	£38

MINI OFFICE II

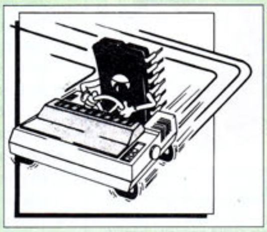
DISC Version for BBC B & B+	£14.00
DISC Version for BBC Master	£16.00
DISC Version for the Compact	£18.00

(When ordering please specify for which Micro & 40 or 80 track Disc)

View Printer Driver Discs

Epson FX & RX 80	£10
Juki & Brother HR	£10

View Printer Driver ROM



View is a powerful word processor, but it seriously lacks in terms of printer driver support. With the View Printer Driver ROM, the View users will find themselves in the realms of advanced word processing.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built-in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redifinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute ★ command when printing.

Other features include a very powerful on-screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory-based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips.

Price: Only £29

CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

OFFICE MASTER



CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trial balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE



- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features

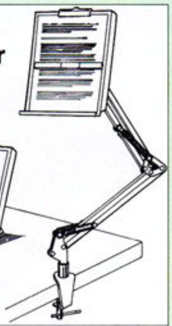
BEEBPLOT – Provides visual representation from Spreadsheet data.

Only £10 (Disc)

Acorn Speech Synthesizer package complete, for the BBC B Microcomputer

Special Offer £14

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip.

Desk Top **£8**

Angle poise **£12**

NEW Copy holders as above but with a battery operated, remote controlled cursor/ruler. (By hand or foot pedal.) (Batteries 2 x AA not included.) These units are extremely handy.

The Epson RX/FX/KAGA Printer Commands Revealed Handbook

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out? Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from Basic and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

£5.95 (No VAT)

BOOKS (No VAT on Books)

15 Hr Wordprocessing BBC/View	£6.95
15 Hr Wordprocessing BBC/WW & WW+	£6.95
30 Hour BASIC (BBC Micro)	£12.95
1st Word Plus Rel. 2 Manual	£10.00
A3000 Technical Reference Manual	£29.00
Acorn DTP A Guide to	£17.00
Advanced User Guide for BBC	**£10.95**
Archimedes 1st Step – Beginners Guide	£9.95
Archimedes Assembly Language	£14.95
Archimedes BBC Basic Guide	£20
Archimedes DTP Manual	£10.00
Archimedes Operating System	£14.95
Archimedes Risc-Os Programmers Reference Manual	£79.00
Assembly Language Quick Ref.	£21.95
BASIC 2 – User Guide	£2
Basic V – A Dabhand Guide	£9.95
BBC Basic Guide (Archimedes)	£19.95
BBC Micro – Within the	£11.95
BCPL User Guide	£9
C Big Red Book of	£8.95
C – A Dabhand Guide to	£14.95
C Programming Lang. 2nd Edition	£24.95
COMAL – Introduction to	£9.50
Deutsch Direkt! (Book only)	£5.95
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
FORTH on the BBC Micro	£9.95
ISO-PASCAL Reference Manual	£9.95
Master 512 Guide – Dabs Press	£9.95
Master Operating System	£12.95
Master Reference Manual Part 1	£14
Master Reference Manual Part 2	£14
Master Reference Manual – Advanced	£17
MINI OFFICE II – A Dabhand Guide	£9.95
Mouse User Guide to BBC Micro – the Complete	£5.95
Example Programs on Disc for above	£4.95
PASCAL Programming	£10.95
Risc OS Style Guide	£9.95
RISC Technical Manual 260 pg	£14.95
The Epson FX-KAGA PRINTER Commands REVEALED	**£5.95**
Understanding Interword – A Beginners Guide	£4.95
View 3.0 User Guide	£10
View Guide (View 2.1)	£5.00
View, Viewsheet & Viewstore – Mastering	£12.95
VIEW Dabhand Guide	£12.95
Viewsheet User Guide	£10
Viewstore User Guide	£10
Z88 – A Dabhand Guide	£14.95
Z88 Computing	£9.95
Z88 Magic	£14.95

BOOKS for IBM PC & Compatibles

1-2-3 For Business	£25.95
1-2-3 Mastering Release 3	£22.95
1-2-3 Mastering – 2nd Ed.	£22.95
1-2-3 Quick Reference	£8.45
1-2-3 Using – Rel. 3	£25.95
8086/8088 Ass. Language Quick Ref	£8.45
8086/8088 Programming the	£17.95
Accountancy software in Business – Using	£14.95
Agenda – Using	£21.95
Aldus Pagemaker 4	£21.95
Aldus PageMaker – Using	£21.45
Amstrad 9512 – Using the	£10.95
Amstrad Basic 2 User Guide	£9.95
Assembly Language Quick Ref	£8.45
Autocad 4th Ed – Mastering	£31.50
Autocad – Mastering Through Rel. 10	£28.95
Autocad – Inside Release 11	£32.45
Autocad – Inside 6th Ed	£36.95
Autocad – Mastering Through Rel II	£28.95
C Introducing	£12.95
C Programming Language 2nd Ed	£26.95
C – Teach Yourself	£19.95
Clipper – Using 2nd Ed	£22.95
Computer Users Dictionary	£9.95
Corel Draw 2nd Ed Mastering	£26.50
Corel Draw Quick Ref Thro V1.2	£7.95
Corel Draw made easy	£19.95
Corel Draw v2 Quick Ref	£8.45
dBase 3/4 Complete Ref	£27.45
dBase III Plus – Complete Reference	£19.95
dBase III Plus Handbook 2nd Edition	£22.95
dBase Instant Reference (III & III+)	£10.95
dBase 4 – Handbook	£21.95
Desk Jet Unlimited	£19.95
DOS & BIOS Function – Quick Ref Guide	£7.95
DOS Instant Ref.	£9.75
DOS Instant Reference (up to 3.3)	£6.95
DOS Power Tools	£46.45
DOS – Programmers Ref. Manual 2nd Ed	£25.95
Excel for Windows – Quick Ref.	£8.95
Fax – Management with	£7.95
FAX – Managing with	£12.95
Framework III – Mastering	£24.50
GW Basic Users Guide & Ref	£12.95
Hard Disc Instant Ref	£10.95
Hard Disc management – Quick Reference Guide to	£4.95
Hard Disc – Using Your	£27.45
IBM PC & PS/2 – Inside the 3rd Ed	£21.70
Microsoft GW BASIC	£17.95
Microsoft Windows 3 – Using 2nd Ed	£20.95
Microsoft Windows Illustrated	£21.95
Microsoft Word 5.5 – Using	£20.45
MS-DOS – ABC's of 2nd Ed.	£17.95
MS-DOS Bible 3rd Edition	£22.95
MS-DOS First Book	£15.50
MS DOS for Beginners	£17.45
MS-DOS Quick Ref Guide 5	£8.95
MS-DOS – Running 4th edition	£19.95
MS-DOS – Supercharging 2nd Edition	£17.95
MS-DOS Users Guide 3rd Edition	£27.95
MS-DOS – Using	£21.95
MS-DOS 5 – Quick Start	£18.45
MS-DOS 5 User Hand Book	£19.95
MS-DOS 5 – Upgrading to	£14.95
MS-DOS 5 Using	£29.95
MS-DOS Tricks & Tips	£16.45
Netware User Guide	£23.95
Networking Personal Computers 3rd Ed.	£20.95
Norton Utilities – Inside the	£21.75
Novell Network – Mastering	£27.95
Novell Network – The ABC of	£21.95
Novell Network – Using	£27.45
PageMaker on IBM PC – Using	£22.95
Pagemaker – Using	£22.95
PCs & Compatible Computers for Beginners	£17.95
PC Crash Course 2.0 2nd Edition	£19.95
PC Tools – Quick Ref	£8.45
Programming Guide to EGA & VGA Cards	£25.95
Quattro – Mastering Pro 3	£21.95
Quattro Pro III – Using	£25.95
Quatro Pro Quick Ref.	£8.45
Smart – Using	£21.45
Smartware II – Mastering	£22.95
Smartware II – Using	£27.45
Smart, tips, tricks and traps (QUE)	£22.95
Supercalc 5 – Using	£27.45
Supercalc Professional	£17.95
Symphony Made Easy	£15.95
Symphony – Using Special Ed.	£27.45
Symphony 4th Edition – Mastering	£24.95
Turbo C Bible	£27.95
Turbo C++	£22.95
Turbo Pascal 5 – Using	£22.95
Turbo Pascal Using	£27.45
Unix – Using	£27.45
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Ventura Mastering – 2nd Ed.	£22.95
Ventura Publisher – Using	£22.95
Ventura – Instant Reference	£10.95
Ventura – 3rd Edition	£24.95
Window Programming 2nd Ed	£27.95
Window 3.0 Programming	£27.95
Window 3.0 Quick Ref.	£7.95
Word for Windows made easy	£15.95
WORD for Windows – Using	£22.95
Wordperfect – Illustrated	£21.95
Wordperfect 5 – Using	£22.95
Wordperfect – Quick Reference V5	£8.45
Wordperfect 5.1 – ABC's of	£18.95
Wordperfect 5.1 – 1st Book of	£15.95
Wordperfect 5.1 – Mastering	£24.95
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New Release

ACORN TO PC

Stop the Confusion!

Do you have to use both Acorn computers and PC's? Would you like to use your Archimedes or A3000 in PC-emulation mode but are unsure of the new commands?

Although Acorn machines (such as the BBC B, the Master, the Archimedes and the BBC A3000) are mainly used in education, most commercial computers use other operating systems, particularly MS-DOS. As a result school computer users are at a disadvantage when moving into 'business' computing. PCs and other commercial computers use MS-DOS as the operating system, so commands for formatting, copying, backing up, printing and the modem are not the same. Even file names are written differently! And did you know that there is one Acorn command which, if used in MS-DOS, wipes everything in the current directory?

'ACORN TO PC' enables you to change over painlessly. It shows clearly and quicly how, why and where the two systems (Acorn and MS-DOS) differ. As with a foreign language dictionary, you can use the book to transfer either way – from Acorn to MS-DOS, or from MS-DOS to Acorn.

'ACORN TO PC' also acts as a handy reference guide to all Acorn star commands and their MS-DOS equivalents. It also has an extensive and readable explanation of the directory tree and hierarchical filing systems in general. Both DFS and ADFS Acorn systems are covered.

'ACORN TO PC' is written clearly and concisely by Dr. John Lockley, who has wide experience of writing and broadcasting. He is currently appearing as a regular contributor on Radio 5, and is co-author of 'The Complete BBC Computer User Handbook'.

Price: £12.95 (No VAT)

The Complete BBC Computer User Handbook

If you own a BBC B, B+, Electron, Master 128 or Master Compact, or Archimedes, then this is the book for you. It shows how to get the best from your machine, and how to make it work for you. The general style and level of presentation means that both the expert and beginner alike will feel comfortable with the quality and quantity of the material.

Subjects covered include the general use of computers, hardware design and peripheral devices like printers, disc drives, etc, and Networking. Programming hints and tips and various disciplines for making a better program are discussed in some detail, including debugging of specific errors. Standard programs are covered, such as wordprocessors, spreadsheets, databases, graphics, communications, etc., which brings you neatly on to the subject of using computers in the office or at work – even giving advice on writing and marketing your own programs.

A book you will enjoy to use as a reference, or read from cover to cover, over and over.

Only: **£14.95** (No VAT)

The Complete Mouse User Guide to BBC Micro

This manual has been written to reveal the secrets of the mouse. It explains all the principles required by the hardware and associated software, and also example listings for inclusion into custom programs. The manual first details the basic principles of the mouse and a simple program which uses these principles. This information should be adequate for most applications. However, it is possible to improve the performance of the mouse by expanding on the principles already used in the software. This is again fully explained and an example program given.

It is possible to gain a full understanding of the mouse from this manual. For those not interested in exactly how the mouse functions, complete example programs are also included. These may be typed directly into the micro, without the need for any understanding of the hardware or software involved, enabling the mouse to be used for custom applications.

Price £5.95 (No VAT)

Example programs on Disc £4.95

Beeb PC (BASIC)

Beeb PC Basic is designed for program authors wishing to convert programs so that they will run on IBM personal computers. To convert BBC BASIC programs manually can waste days of valuable time with every occurrence of common statements such as PROC, DEFPROC, TAB, having to be changed.

Beeb PC (BASIC) automates many of these changes, and will convert majority of BBC statements that are invalid for IBM BASIC into equivalent acceptable statements. In addition BBC BASIC data files can be converted to IBM BASIC format, with support provided for all BBC data formats:- INTEGER, REAL & STRING.

Price: £38

Beeb DOS 3.0

(Now reads Archimedes Discs)

The BBC and IBM PC's are the most popular micros in the UK. The BBC is firmly established in the education sector and the IBM is the industry standard in the business world. The pools of information and applications held on these computers are immense, yet the means of passing information between them are very limited. Beeb DOS provides a practical method of transferring information between these two micros.

Beeb DOS is a collection of utilities which run on the PC's and enable it to read and write information on BBC discs. You can transfer files between your PC's 360K floppy, high density floppy or hard disc and your BBC discs. In addition Beeb DOS allows you to catalogue, format and compact BBC discs and delete, re-name, lock and unlock BBC files, all on PC's. Each Beeb DOS utility is written in IBM assembler and is run directly from PC or MS-DOS. The Beeb DOS utility can be run from floppy disc, hard disc or RAM drive.

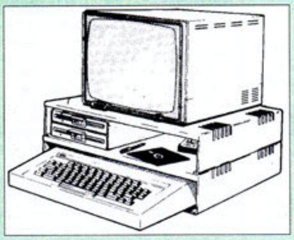
Beeb DOS is supplied on an IBM 5.25", 360K disc complete with a comprehensive operating manual. (Will only work on 360K Disk Drives & read only ADFS and Watford DDFS – not DFS).

Price: £39

(Please write in for technical literature)

Continued→ → → → → →

Plinths for the BBC B & Master 128K Micros



Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationery. The computer slides neatly in the lower section allowing easy access to remove the lid. Colour: Matching BBC Beige.

Single BBC Plinth	420 x 310 x 105mm	**£13**
Double BBC Plinth	420 x 310 x 210mm	**£24**
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(Carr. Single plinth £2; double plinth £3)

ADDER

Features:

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
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- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: 2516, 2716, 2532, 2732, 2764, 27128, & 27256.

£55 (£5 Carr)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast.

- **ERASER EB** – Standard version erases up to 16 chips. **£34**
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- Spare UV tubes. **£12**

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This extremely useful tool allows you trouble free chip insertion and removal from your computer by distributing the removal force over the whole body of any 24 or 28 pin chip. **£2**

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Ideal for removing dust & dirt from Keyboard & similar inaccessible spaces. **£3**

PC Cleaning Kit

To avoid data corruption and trouble free use of your PCs, it is advisable to clean your PC System once a week. Our Kit 14 is ideal for the purpose. **Kit 14** – 1 each, 3.5" & 5.25" Cleaning Disk, 2 cleaning pads; Drive head cleaning fluid; 20pcs general purpose wipes; Anti-static screen cleaning fluid; General surface cleaning fluid and a transparent plastic case which can hold ten 5.25" Disks when empty. **£12**

Spares for BBC Micro

UHF Modulator	£4	16MHz Crystal	£2
Speaker Grill	£1	17.734 MHz Xtal	£2
Speaker	£3	32.768MHz Xtal	£1
Keyswitch	£1.50	BBC B Refurbish	
Master PSU	£59	Casing	£25
Master Keyboard	£62	Keyboard	£46
Master Casing	£49	Power Supply	£59

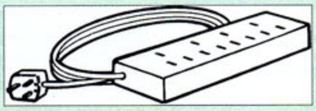
Replacement Flexible 17 way Keyboard Connector **£4**

Surge Protector Plug

Fitted in place of your normal mains plug, this device protects your equipment (and data from corruption), against mains high voltage translent spikes/surges caused by lightening or thermostats switching.

Protection for only **£8.50**

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4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals. **£9.50**

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28pin DIL Header Plug

SOLDER type **£1.50** IDC CRIMP type **£1.95**

8 Way DIP Switch

Increase the speed of your Disc Drives by soldering this switch to your BBC B or B+ keyboard

Only **£1.00**

28 pin ZIF SOCKET (Textool) **£6.95**

SIMs & SIPs

- 256 x 9-8 **£11**
- 1Mb x 9-10 **£28**
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(All ready made and tested)

CASSETTE LEADS 7 pin DIN Plug	
to 3 pin DIN Plug + 1 Jack Plug	**£2.50**
to 7 pin DIN Plug	**£3.00**
to 3 Jack Plugs	**£2.50**
6 pin DIN to 6 pin DIN Plug (RGB)	**£3.00**

Disc Drive Power Leads

Supply from BBC power supply to standard Disc Drive Connection: Single **£3.00**; Dual **£3.75**

Disc Drive Interface Leads

BBC to Disc Drives Ribbon Cable
Single **£4** Twin **£6**

Miscellaneous Connectors

	Plugs	Sockets
RGB (6 PIN DIN)	50p	75p
RS423 (5 pin Domino)	70p	80p
Cassette (7 pin DIN)	40p	95p
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Paddles (15 pin 'D')	150p	250p
Disc Drive Plug 4 way	100p	–
6 way Power Connector	120p	150p

Watford DATA DUCK

Convert two single Disc Drives into one Dual Drive with this simple external unit (Suitable for Disc Drives with PSU. For Disc Drives without PSU, you will also require Watford Power Duck, see below). **£14**

Watford POWER DUCK £8

CHIP SHOP

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LM324	£0.45
SN76489	£5.50
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2764-250nS	£3.00
27128A-250nS (12V5)	£2.50
27128-250nS (21V)	£4.00
27256-2	£3.00
27512-2	£4.50
27C101G (1 Meg)	£7.00
4013	75p
4020	£1.00
4164-10	£1.55
4464-10	£3.50
4816 RAM	£2.00
41256-8	£2.00
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6264LP-8K	£4.00
6502A CPU	£5.00
65C02 3M	£9.75
65C12	£9.00
6512A	£10.00
6522	£4.00
6522A	£5.00
62256ALS-15	£10.00
62256P-12	£8.50
6818	£4.00
6845SP	£6.00
68B50	£2.95
68B54	£7.50
7438	50p
74LS00	50p
74LS04	50p
74LS10	50p
74LS123	£1.00
74LS163	£1.00
74LS244	£1.00
74LS245	£1.00
74ALS245	£2.75
74LS373	£1.00
74LS393	£1.00
75453	£1.00
75159	£3.00
8271	£49
9637	£2.00
ICL7673PA	£3.00

Assorted ROMS



ACORN ADFS	£25
ACORN BASIC 2 plus User Guide	£22
Acorn BCPL	£42
ACORN DNFS	£17
Acorn FORTH	£32
Acorn Graphics	£25
Acornsoft C Disc	£36
Acorn LISP	£19
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Acorn OS 1.2	£14
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BBC PCB Designer	£49
Beebmon	£22
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Communicator	£49
Dump Out 3	£25
EPSON NLQ ROM	£25
Graphics Extension Rom	
GXR-B	£21
GXR-B+	£22
ICON Master	£28
Logotron LOGO	£43
MASTER OS ROM	£38
Master ULA (47)	£15
Master ULA (60)	£10
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Microtext Disc	£46
Microtext Rom	£199
NLQ DESIGNER	£25
Numerator – Archi	£69
Numerator – BBC	£39
Pendown ROM	£32
Rom Manager	£20
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Termulator B, B+	£28
Termulator Master	£32
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ULTRACALC II	£26
1Mb OS ROM	£39

Hi-Speed, Low Cost Archi Hard Disc Drive

Watford's advanced interface allows IDE drives to work on any Archimedes machine, speeds in excess of SCSI devices can be obtained at a fraction of the cost of a SCSI drive.

Up to four drives are supported by the IDE filing system IDEFS, up to two drives can be attached to each expansion card, up to four cards can be installed in a machine. An optional 20Mb or 40Mb hard disc can be supplied on the podule expansion card itself, with its fast transfer rate and power saving modes the drive is ideal for storing commonly used software such as the !Fonts application.

A powerful security feature has been provided with the two unique commands *IDELock and *IDEUnlock, ideal for educational establishments where hacking or tempering may be prevalent that may lead to loss of data. Once locked, the configuration can not be changed until a secret password is used. The !IDEForm Write Protect option is particularly useful in conjunction with *IDELock as it will prevent any unauthorised deletion of data.

By an innovative use of on-board memory, the card will remember its configuration, even if moved to another slot or even a different machine, this also includes the unique security features.

Hardware

- Single width EuroCard
- Supports proposed ANSI ATA (IDE) specification
- Fast 16 bit MEMC interface interrupt driven to support background disc operations
- 5 Mbytes per second peak transfer rate
- Built in Non Volatile RAM to hold configuration
- LED activity indicator
- 37 way D type socket for external drives
- Optional on-card 20Mb or 40Mb hard disc
- Up to two drives (master and slave) per card
- Multiple cards per machine (up to four)

Software

- Conforms fully to the Acorn IDE Specification
- All software supplied in ROM
- Filing system 'IDEFS'
- Desktop filer with drive ready detection and disc name under icon
- !IDEForm, WIMP based configuration and formatting software
- Drives can be individually write protected
- Up to four drives over multiple cards
- Power saving standby modes supported with configurable timeout
- Drives can be used without translation in native mode for minimum overhead
- !IDEFSDisk, creates PC emulator hard discs

Prices

Part No.	Capacity	Access Speed	Price
ADA 0520	44Mb	28mS	£249
ADA 0530	100Mb	16mS	£379
ADA 0570	200Mb	15mS	£499
ADA 0580	330Mb	15mS	£895

All the above 3.5" hard drives are supplied complete with Controller Card, cable & Software on ROM. (Internal fitting). For use with A300/A400/A500 series machines.

For A3000 users an additional external Case and PSU will be required.

AAA 0300 External Case & PSU for A3000	£85

Internal Hard Disc Drives for A3000

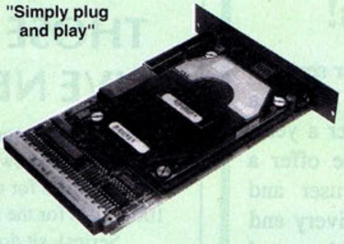
State of the art, 4 layer internal IDE Hard Cards for the A3000. Software supplied in, On-board ROM.

ADA 0700	21Mb	23mS	£185
ADA 0720	44Mb	19mS	£385
ADA 0750	60MB	18MS	£425
ADA 0730	89Mb	18mS	£685

Supplied ready assembled. No soldering required. Simply plug into the alloted space.

Archi IDE Hard Cards

"Simply plug and play"



Watford's NEW low cost, high performance revolutionary IDE Hard Cards for the A300 and A400 series Archimedes are unbelievably easy to install – you simply slot one into any vacant podule backplane slot in the rear of your computer. These stunningly engineered, light weight but fast, 2.5" miniature hard drives are mounted onto the professionally designed cards, and are supplied with the fully Acorn-conformant IDE Filing System ready installed and ready to run. A novel feature of the hard cards is that they can be easily removed and transported to another Archimedes, for example to make a hard disc backup, or to transfer saved files from work to home etc. Security of files on the hard disc is ensured by our unique security password lock, which allows files to be read only, but not overwritten or deleted - ideal for use in school applications where the integrity of your master software needs to be retained.

ADA 0650	21Mb	23mS	£199
ADA 0660	44Mb	28mS	£375
ADA 0670	89Mb	18mS	£675

(Can be used as a Removable Hard Drive)

NEW Archimedes A300/A400 SCSI Hard Disc Offer
(while stocks last)

100MB Hard Disc Upgrade complete with Controller card, Cables, Formatter and Manuals

RRP: £999

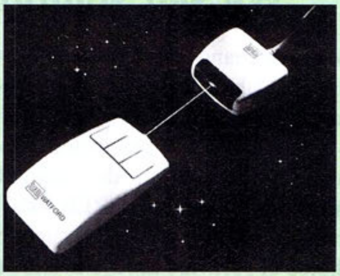
Offer Price: £399

Syquest Removable Disc Units

These Hard Drive units are supplied complete with a cartridge 42Mb removable, cables and a high flow fan for cooling.

Syquest Drive Unit pack	£399
As above + SCSI Card	£535
Spare 42Mb Disc	£55

NEW Archimedes Cordless Mouse



Ever found that using a mouse on a busy desktop has its problems? The cable is always being caught up in papers, tangled round equipment and other cables etc, and what about that cup of coffee spilled over your work!

Watford Electronics' new Cordless Mouse solves these problems by removing the cause for concern - replacing the cable with a simple infra red link. It still provides all the speed and easy control of a conventional mouse, but with complete freedom. In use, there are no operating differences between the standard mouse and the new cordless mouse so all mouse functions and mouse driven RISC software will be fully compatible. Pinpoint accuracy is ensured by a unique Accelerator button, which, when pressed, moves the pointer by just a tiny amount for a large slow movement of the mouse, but by a large amount for a quick wizz of the mouse.

Features

- Infra Red Signal Transmission
- High Resolution 200 DPI
- High Tracking Speed of 600mm/s up
- Anti-static Silicon Rubber Coated Ball
- Low Friction Teflon Footpads
- Power - by two AAA size batteries (not included)
- Automatic Standby Mode after 5 seconds inactive
- Auto Power Shut-Down after 20 seconds inactive

Price £59

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- Cambridge Computer Dealer
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- NEC Appointed Dealer
- Panasonic Premier Dealer
- Roland Plotter Official Dealer
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250 Lower High Street, Watford WD1 2AN, England
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Acorn

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The Fourth Dimension Archimedes Specialists

The following software is compatible with the Acorn A3000, A5000 and ALL Archimedes computers


Holed Out Compendium £24.95



Enter The Realm £24.95


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If you buy 2 or more products directly from us you may deduct £10 from the total cost.

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Hopefully Feb '92



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Nevryon £19.95



In the first of a two-part series on special needs, **CHRIS DRAGE** looks at some hardware options

WITHIN **REACH**

The hardware options for special needs computing have been growing steadily in recent year. This is especially true for the RiscOS machines which, until recently, were overshadowed by the Beeb.

Acorn has now put together a BBC A3000 Special Access System (see above) in two guises: the first includes the computer, a serial upgrade, Morley Electronics' User/Analogue card and seven utility programs; the second also includes a monitor and Pres monitor stand.

The upgrades allow access to overlay keyboards, touch screens, modems and switches, but it is the utilities provided which are at the heart of the package. One of the utilities provided is *ASP*, switch interface software which allows disabled users to access Risc OS applications, by using a single switch device.

The others included are: *SpecialKB* which allows the numeric keypad to emulate mouse functions with a very useful 'sticky keys' option to emulate multiple key presses. *BigPtr* offers an enlarged and visible pointer whereas *Closeup* presents a small magnified window which can move around the screen. *Flasher* gives a more visible flashing caret and a cursor-homing device. With *Chars,* typing can be achieved, using the mouse to select characters from a screen display. *Bigscreen* (Mode 36 & 37) and *ScreenV* (Mode 43) are both large screen modes to display text, icons and menus in larger sizes. The Acorn package also allows you to use Midi (musical instrument digital interface) equipment.

There are many other interfaces and upgrades that can be used to connect up external devices (the Morley Electronics User/Analogue podule is good value for money) but Access 1000 from Hybrid Technology enables overlay keyboards, touch windows, joysticks, switch units and the company's *Arc Recorder* to be connected to a BBC A3000/Archimedes computer without using the standard podule user port.

Indeed, the Access 1000 combines the functions of the user port and a switch access box forming the basis of Hybrid's Access Link, which permits add-ons to be daisy-chained on to the computer's printer port. These avoids the need for the serial port upgrade so leaving it free for other add-ons. The interface has four jack sockets designed to take switches and a familiar BBC-style user port connector and also provides a small through-connector with the printer connected at the end of the queue.

To input information into the computer without relying on the keyboard, the Concept



Touch screens encourage improved dexterity


Northwest SEMERC's Overlay Keyboard

Keyboard is the mainstay, with over 120 overlay keyboard programs. The overlay keyboard is extremely versatile, since it is simply a piece of paper. Basically, it provides a choice of icons which the user presses instead of the normal keys. They consist of 128 programmable cells, but you don't need to know that since you usually only load a program and use it. *Concept Designer* and *Conform* make programming the device easy, if you want to create overlays for a specific purpose. *Touch Explorer Plus, Folio, Concept Kids* are also impressive programs.

The Overlay Keyboard is made from high-impact plastic, which makes it both light and sturdy, meeting educational safety and design criteria extremely well. It works with the BBC B/Master and the BBC A3000/Archimedes if a user port or Access 1000 is present. A single switch interface ia built in as standard and is used by inserting the switch jack plug into a socket which automatically disables the keyboard and selects the switch. Most importantly, the Overlay Keyboard is completely compatible with all existing software.

Other input devices include touch screens (see *BAU* February 92 issue), alternative keyboards, mice, trackerballs, switches and voice input devices. Two leading TouchWindow systems (Keyboard Technology and Lingenuity) are made up of the same hardware, with differing software drivers. They are accurate, responsive and can be adapted to fit almost any monitor. Their high resolution, coupled with the ability to be removed from the monitor to be used as a 'tracing window', add to their versatility.

One successful alternative to the mouse is the Delta Cat which can prove very useful in specific circumstances, especially if the joystick is firmly mounted and an extension tube is fitted over the stumpy control stick. It can offer control via foot (buttons) and mouth (stick). If you require a better mouse than the standard one provided with the Archimedes, then I recommend Clares' rodent, which nestles comfortably in the palm of the hand, allowing the fingers to rest more naturally over the buttons.

For a trackerball (literally an upside-down mouse) the sturdy Marconi unit has performed well over the years, but is shortly to be eclipsed by the new Ark Tracker. Not only is this tracker ball extremely rugged but it has all the mouse operations on separate buttons. A perspex overlay can be added to help with locating the buttons and a separate switch provides control over the pointer speed. As the unit remains stationary, pointer operation is controlled, with the fingers alone negating the need to move the whole arm – useful for a disabled person who has fine motor control but finds larger arm movement more difficult.

For those whose only means of communication with a Beeb is their voice, the MicroMike has proven successful, giving voice-volume control over a variety of activities. It can promote vocal play, control of volume and timing of vocalisation. In order to use the device with an A3000/Archimedes, a user port must be installed. The popular *Sid and Mike* software has now been converted to Archimedes use.

Alternatives to the standard keyboard are available from Special Access Systems, starting with a metal keyguard which fastens on to the keyboard. Holes on the keyguard permit hands to rest on the guard, while fingers can access individual key holes. The company's Programmable Expanded Keyboard should also prove valuable to those who are restricted to using a toe, mouthstick, headpointer or a single finger. Users can also perform multikey presses as one operation and four programmable delays can cope with uncertain or over-long key presses. Furthermore, bright LEDs or programmable sounds can help those with sensory disabilities to know when a key has been pressed.

Contact Keyboards (Keyboard Technology) clip on over the existing keyboard, keeping unused keys hidden from prying fingers and making programs highly resistant to accidental crashes. Obviously such a device is tied to specific software applications and as yet, only two models are available: the Matchbox Keyboard (for matching games) and Moneybox Keyboard to accompany the Moneybox suite of software. One advantage of these devices is that they provide sensory feedback to the user.

Incidentally, the Matchmaker interface can be used to connect virtually any input device device (switch, joystick, trackerball, overlay keyboard, and so on.) Next month, we will look at the software options for special needs.

THE LAST WORD



It always makes sense to see hardware in action before you rush out and buy it. The good news is that all of the hardware mentioned here will be on show at the Northwest SEMERC's Micros for Special Needs Exhibition in Oldham in October. Northwest SEMERC, under director Martin Littler (right) is a fountain of information, help and advice. If you are involved in special education, then the exhibition is worth a visit. Northwest SEMERC also publishes a special needs newsletter entitled Copy which is full of interesting case studies and reviews of how people are coping with the BBC, A3000, Archimedes and other machines. Contact Northwest SEMERC on 061-627 4469.

PRODUCT DETAILS

Product: BBC A3000 Special Access System
Suppliers: Acorn Computers
Tel: (0223) 245200
Prices: £679 without monitor, £899 complete. Educational establishments and home users registered as disabled pay £579 without monitor, £765 complete

Product: Overlay Keyboard
Suppliers: Northwest SEMERC
Tel: 061-627 4469
Price: £120 (education discounts)

Product: Access 1000
Suppliers: Hybrid Technology
Tel: (0223) 861522
Price: £49 (£58 with Access Link power supply)

Product: Touchwindow and Contact Keyboards
Suppliers: Keyboard Technology
Tel: (0509) 610706
Price: Touchwindow – £244. BBC driver £25. The Contact Keyboard: £29.95 – £37.50 (BBC B), £47.50 (BBC A3000/Archimedes)

Product: Touchwindow
Supplier: Lindis International
Tel: (0986) 85477
Price: £248

Product: Alternative mouse
Supplier:Clares Micro Supplies
Tel: (0968) 85477
Price: £27.24

Product: Delta Cat
Supplier:Voltmace
Tel: (0462) 894410
Price: £29.74

Product: Marconi Trackerball
Supplier: Technomatic
Tel: 081-205 9558
Price: £30

Product: Micromike
Supplier: Daco Software
Tel: 021-7068933
Price: Standard Micromike,£43.50 Desktop Micromike, £52.50

Product: Keyguards and Programmable Expanded Keyboard
Supplier: Special Access Systems
Tel: (0203) 711861
Price: £470

Product: Matchmaker
Supplier: SRS Systems
Tel: 021-643-2877
Price: £850

All prices exclude VAT

THREE REASONS TO CELEBRATE



Impression II was awarded the Computer Shopper award for the best non-PC business software. Given the prestigious nature of the other nominees, this award is particularly satisfying. Amongst the other nominees were Adobe Illustrator for the Mac, Claris Works for the Mac and WordPerfect also for the Mac.

O

As of the end 1991 sales of Impression topped 15,000 copies, making this the most successful Archimedes product to date.

O

Impression II now forms part of the Acorn Publishing system, a complete top end DTP solution based on the A540, released by Acorn.

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CHANGING FACES

JAN VIBE presents a new look at animation on Acorn machines

Is there anybody who has not seen Michael Jackson's video, *Dangerous*? In the video there is an fascinating sequence of faces which change softly from one to another. This made me wonder if it was possible to do something similar on my trusty Acorn machine. Well, it was, and here it is...

The program draws a face on the screen. Then slowly the face undergoes a metamorphosis, changing into another and another. It is a great showpiece, and has an almost hypnotic effect on people. Part of the inspiration came from an excellent book by A Dewdney called *The Armchair Universe*. In fact, the data for the face is based on an example within the book.

THE THEORY

The program initialises by setting up two screens, an active and a shadow screen. It then generates two completely different faces, let's call them face1 and face2. These faces are stored as PLOT commands in arrays.

In the main loop, the co-ordinates for face1 and face2 are being averaged by a formula which, at the start of the loop is weighted solely towards face1 but, at the end of the loop is is weighted solely towards face2. By using this formula, a face which lies somewhere in between can be generated.

This face is drawn on the shadow screen. When the drawing is finished, the active and shadow screens are switched, the weight is changed a little towards face2 and the main loop is entered again. The face is eventually changed totally into face2, then face2 is made into face1, a new face2 is generated and the changing process starts again.

THE PRACTICE

To run the program, type in *Face1* and *Face2*. (see our yellow pages box). When you run *Face1* some data will be created, then you can run *Face2*, the main animation routine.

The program consists of three parts: an initialisation, a face generator and a main loop, which makes the face slowly change from one to another. The most complex part of the program is the procedure PROCdistort. It takes the array distort and returns it distorted by the required amount. Two arrays, refx and refy, are the coordinates for face1 and face2. The original coordinates are not changed at all by the distortion of the face and are these are therefore stored in a single array.

The distortion method is mainly a simple multiplication around a point. It works like this: X_dist=(X_face-X_ref)*Z_dist+X_ref where X_dist is the distorted x value, X_face is the original value of x, X_ref is the reference point and Z_dist is the distortion factor. The same calculation is of



course being done for Y_dist. In the procedure, the distortion factors (facewidth etc...) are generated by the random number function FNrnd(min,max). Then the nine reference points are read into the the arrays drefx and drefy.

These points are used in combination with the distortion factors when changing certain parts of the face. The first of the reference points is a global point, used for distorting the entire face. Reference points two to nine also go through the distortion calculation. Incidentally, line 1230 in this loop contains the calculation that makes the face egg shaped, with the point either at the top or the bottom.

In the main loop (1290-1650) the points of the face are distorted. The general distortion of the entire face is being handled by lines 1300 to 1320. This calculation is exactly the same as the one shown in lines 1220 to 1260. Most of the distortion of various parts of the face are made by multiplication around a point, but some require that the parts are moved too – such as in the case of the eyebrows. This happens at lines 1370 and 1410 (the distance between the eyes) and also at line 1590 (which produces the raising of the eyebrows).

The part of the face to be distorted by certain factors is controlled by counting the points in the face-drawing and by testing the counter. This is what happens in the various WHEN blocks. When the counter has reached 186, the face drawing is complete. The distorted face is then stored in arrays, which takes place at lines 1630 and 1640.

EIGHT-BIT BONUS

BAU programming guru, David Lawrence has also written a version of *Face* for eight-bit owners. To use it, type in *Face3*, *Face4* and *Face5* (see our yellow pages box) and then run them in sequence. If PAGE is greater than &1100, you need to lower it to this value before running. The program works by calculating the in-between stages (this will take 20 or so seconds) and then the animation takes place.

MODIFICATIONS

There are lots of ways that this program could be extended. Colour is the obvious one, although it might make the program too slow. Or how about user control to make an interactive identikit. Indeed, why stop at the face? The program could be used on the entire human body!

YELLOW PAGES

The program shown here can be obtained in one of two ways. Either turn to our yellow pages section and type the program in, or if you are a subscriber, simply load it from your free monthly disc.

THE BBC MICRO

A forthcoming BBC programme will chart the progress of home computing

Computer technology has taken a quantum leap in the past 10 years or so and now personal computers can now be found in many homes and offices. Yet in the late 70s this was the faraway dream of a few electronics boffins, who were putting together boards and switches on kitchen tables and calling them 'computers'. Personal computing started to gain momentum just over a decade ago, courtesy of the BBC's computer literacy project which set out to explain the principles of computing to a wider audience.

The literacy project was based around various television programmes, the first in 1982 also marked the television debut of the BBC micro computer. *And the rest, as they say, is history...*

It is that history which the BBC is celebrating in a special 30-minute programme, *The Trojan Mouse*, due to be screened on Sunday April 5 (see box for details). This programme will examine the effects of the computer literacy project and the BBC micro on personal computing, as well as highlight the key developments



Humble beginnings with the Acorn Atom

of the past decade. To coincide with the programme, we have put together a special supplement which you can find in next month's *BBC Acorn User*. The magazine was actually launched in response to the success of both the TV computer literacy programmes and the Acorn-produced BBC micro – and we have been around ever since, charting the ups and downs of the Acorn market.

This month, as a 'taster' to the programme, we look back through our archives at some of the key milestones, from the Acorn Atom right up to the launch of the latest Archimedes A5000. For the full story, be sure not to miss our special supplement next month.

ATOMIC

Founded in 1979 by Hermann Hauser and Chris Curry, Acorn Computers launched the System One, followed by the Acorn Atom. Roger Wilson joined the company straight from university to help design the Atom and remains with the company today, developing new projects.

TROJAN MOUSE

The Trojan Mouse is a 30-minute programme charting the introduction of the BBC computer literacy project, the various series on home computing which it launched and the introduction of the first BBC micro computer. Produced by Dave Thomas, who was responsible for producing previous computer programmes, the programme is hosted by Ian MacNaught Davis, who appeared in the first series.

The programme traces the evolution of the project, the related hardware and software achievements, and talks to many of the people who were involved along the way – from Cambridge graduates putting together the earliest prototypes, to teachers whose lives were completely changed by the introduction of the first BBC micros.

Innovators from Acorn, including Hermann Hauser (co-founder of Acorn) and Roger Wilson and Steve Furber (who helped design the first BBC micro and later developed the Arm chip) are interviewed. But the programme isn't just about the past – it brings you up to date with current developments and poses some questions about the future.

So be sure to tune in to Trojan Mouse on BBC1, Sunday April 5, 10.30am. (The programme will be repeated on Monday April 13).



THE BRIEF

To support the computer literacy project, the BBC was looking for a partner to produce and market a home computer, which would be featured in the first series. Richard Russell at the BBC produced a detailed specification for the



required machine. Hermann Hauser and Chris Curry put forward the Acorn Proton design, which was to more than match the specification. In April 1981, Acorn was contracted to supply 12,000 machines that the BBC expected to sell by mail order...

ONE YEAR ON

'Where do we go from here?' asked John Radcliffe, executive producer of the computer literacy project, one year after it was launched. The figure of 12,000 machines was cautious – in fact, more than that were ordered before the first series was even screened.

The result? A runaway success for the BBC and Acorn with further series in the pipeline. Also the Micros in Schools scheme was launched – the brainchild of Kenneth Baker, the education secretary at that time. The scheme was to subsidise the purchase of BBC micros and other approved machines.

THE ELECTRON

Chris Curry wanted to lead Acorn further into the fast-expanding mass market for cheap computers and Acorn launched the Electron in 1983, timed for the Christmas rush and priced at £199. While popular, it was to be dogged by production problems and by Christmas 1984 public enthusiasm had waned and one-third of the Electrons built were apparently never sold.

: TEN YEARS ON

since the BBC micro made its TV debut 10 years ago. **BARRY MONK** reports

JUST THE BUSINESS

The Acorn Business Computer was launched in 1984, but it was large and unwieldy and never recouped the huge resources expended on its development.



The BBC Master-driven Domesday machine

Following a disastrous Christmas 1984 sales period, newspaper articles, particularly in *The Sunday Times*, suggested all was not well with the company.

The share price fell and finally the Italian computer giant, Olivetti, stepped in to save the company. Curry and Hauser signed away their controlling interests to Olivetti, but both stayed on as board directors.

MASTER STROKE

Launched in 1986, the Master series seemed to some observers as an anomaly. It was refinement of the original BBC micro at a time when there was a mass migration, by other cheap computers, to the 16-bit, MS-Dos standard of the successful IBM PC.

While cheaper to manufacture, the Master was more expensive to buy and, outside the Acorn education stronghold, it did not achieve the same level of sales as the original BBC micro. The Master Compact followed, but offered little that was new, except that it was packaged in three boxes rather than the customary two.

THE DOMESDAY PROJECT

The BBC Domesday Project was launched in 1986. It was meant to be a modern equivalent of *The Domesday Book*, using modern technology (notably a laser video disc system) to store and retrieve a massive amount of information about general life in Britain.

SPECIAL SUPPLEMENT NEXT MONTH

To coincide with the programme, BBC Acorn User is producing a special supplement which will appear in next month's issue. It will be packed with interesting facts and figures, charting the ups and downs of the Acorn market and looking at some of the key people who have helped to shape home computing.

Producers involved with the early series will give their assessment of what has taken place over the past decade and we will trace the history of Acorn in detail, with a machine 'family tree' and profile the key people involved.

There will also be an overview of the impact of computing on education, how the BBC micro changed some people's lives, and we'll be doing some crystal ball gazing into the future.

So, whether you are an avid BBC micro fan, or you are just interested in finding out why this machine has had such an impact on personal computing, be sure not to miss our special supplement.

Place an order with your newsagent now – you can use the special coupon on page 85 of this issue. Or to subscribe to the magazine turn to page 29 for details of our special subscription offer.



TAKING RISKS

The advanced research and development team, under Roger Wilson and Steve Furber, developed the Arm chip and its companions that eventually became the Archimedes 300 and 400 series computers. Based on Risc technology, the original machines carried the BBC tag, but this was to cause much controversy as the Corporation was seen to be endorsing untried technology. The original (stop-gap) Arthur operating system was later to become Risc OS.

HAIL THE A3000

The new BBC micro, which was viewed as the logical 32-bit successor to the Master series, was the A3000. More affordable than the Archi-



medes, the neat single-box design encased a machine which was 10 percent faster than the Arc, and represented a more keenly priced BBC micro which would appeal to both education and home users. The Learning Curve package, including an A3000 and supporting software, was the next marketing step to encourage more home computer sales.

UP TO DATE

Acorn has updated the Archimedes with the 440/1 and top-of the range A540, as well as the R140 Unix machine. The Archimedes A5000 is the latest Acorn machine.

Revealed at the *BBC Acorn User* show last October, it is a three-box solution (machine, keyboard and multiscan monitor) featuring the fast Arm3 chip and new operating system, Risc OS 3. PC-like in appearance, it retains Acorn's philosophy of advanced technology within a marketable package. But what of the future? Find out in next month's special issue of *BAU*.

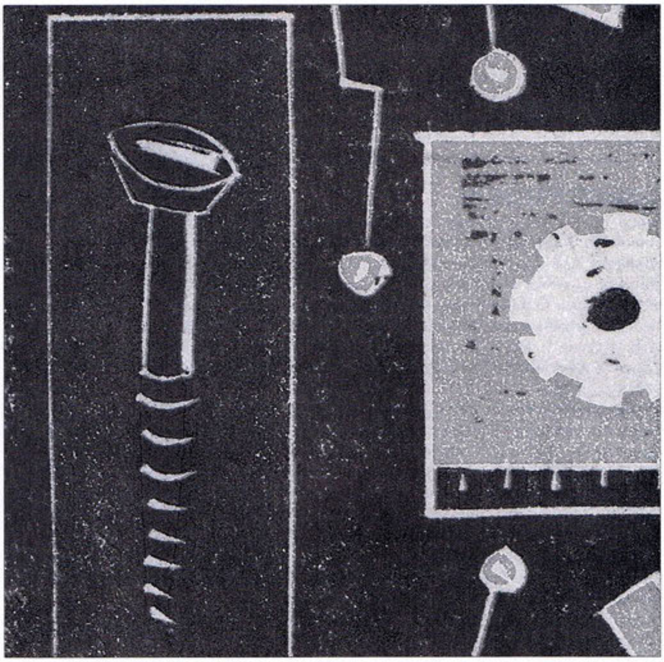


ILLUSTRATION BY PAUL SCHOFIELD

ASSEMBLY LINE

DAVE LAWRENCE continues his series on Arm programming with a look at negative numbers

If you've been following this series, you will know I promised to start this month with some more information about negative numbers. I've already introduced the concept of the *twos complement* method of representing negative numbers, and all that remains is to tell you how you can directly load registers with negative numbers. Unfortunately you cannot use the obvious: MOV R0,#-4.

The instruction that we use is MVN or MoVe Not, but, to be even more awkward, you cannot simply say: MVN R0,#-4 or even: MVN R0,#4.

For some reason best known to Acorn, you have to supply the *ones complement* of the number. Remember with twos complement you change all the 0s to 1s and 1s to 0s and then add 1. Well, with ones complement, you simply don't add the 1. The easiest way to do it with the Basic assembler is to use the Basic keyword NOT. This is more commonly used to provide the 'opposite' case in an IF statement, such as IF NOT flag% THEN... In fact, NOT actually performs the ones complement of its parameter – very handy! You can therefore load a negative number simply with MVN R0,#NOT -4.

Some other assemblers, such as Acorn's own macro-assembler *Aasm*, actually allow MOV with negative numbers, and simply perform the necessary bit-shuffling on the constant and assemble a MVN instruction instead. Although you might have typed MOV R0,#-1, if you have a look at the actual machine code the assembler has created, it will say MVN R0,#0.

It is not possible to supply negative numbers as parameters to other instructions. It's a silly example, but you cannot say, ADD R0,R1,#-56 as some assemblers may translate instructions such as these into more appropriate ones. You might like to try typing in listing one in the yellow pages, which demonstrates the use of simple arithmetic on negative numbers. Try following through the stages by 'hand' first to make sure you understand everything as it happens.

HEXADECIMAL

Before moving on, I'd like to outline the basics of the hexadecimal number system. Clearly, referring to numbers in binary is quite contrived, not to say time consuming: 'Pardon? Was that 1001101001 or 1001011001?'

Because binary is all based on powers of two, and 10 isn't a power of two, you cannot directly use decimal, which is a shame, since most of you will be used to that already! Some computer systems use base eight, or *octal*, which uses the decimal digits 0 to 7. Converting from binary to octal is relatively easy – you simply take your binary number and chop it into three-bit chunks, which are then converted to octal (effectively decimal in this case).

For example, 923 in decimal is:

```
1110011011
001 110 011 011
1    6   3   3
```

The number 923 in octal is therefore 1633. Note this should be read 1, 6, 3, 3 octal, to avoid confusion with one thousand six hundred and thirty three. The disadvantage of octal is the chunks of three – not a nice power of two! Quadral could be used (with two-bit chunks) but then you're almost back to binary.

So, hexadecimal is the most common notation. This is base 16 and uses four-bit chunks of data, and is often abbreviated to 'hex'.

Of course, decimal only has 10 digits, so the letters A to F are used to represent the decimal numbers 10 to 15. Conversion to hex proceeds as for octal, except in four-bit chunks:

```
1110011011    (923)
0011 1001 1011
  3    9    B
```

Hex numbers are often written with a preceding '&' to avoid confusion with decimal numbers – so 923=&39B. As mentioned before, one binary digit is called a bit. Historically, eight bits are called a *byte*. This is derived from early computers which were eight-bit machines (like the

6502), with *byte* being a corruption of *bite*, being a shortened form of BIT Eight.

So 32 bits are often called a *word*, although some computer systems, such as the 68000, call this a *long word* and use *word* to mean 16 bits. *Words* are 32 bits long in the Arm. Going the other way, half a byte (four bits, one hex digit) is, of course, a *nibble*. And no, I'm not joking!

LARGER NUMBERS

Next on the list of things to explain is larger numbers. Until now, I've told you to keep the numbers that you load into registers under 256, but not to worry about the size of intermediate results. Last month I mentioned that the Arm is a 32-bit processor and can therefore deal with 32 bits at a time. So, why can you not say MOV R0,#987? After all, 987 in binary is only a 10-bit binary number.

The problem lies in the way Arm instructions are stored in memory and also explains why you have to use the ones complement notation for specifying numbers. In the first article in this series, I explained that it is the job of the assembler to translate the 'human' words MOV, ADD, MUL and so on, into the appropriate sequences of bits that the Arm understands.

One of the good features of the Arm is that all its instructions are encoded to the same length, namely 32 bits (one word). It is a coincidence that the processor is a 32- bit processor. Many other processors (such as the 6502, 68000 or 80x86) have variable length instructions. In 6502, PHA is only eight bits 'long', whereas LDA &3D00,X is 24 bits. In such cases it is common for the first byte (or whatever) to be the base instruction and, if necessary, subsequent bytes to form parameters for the operation.

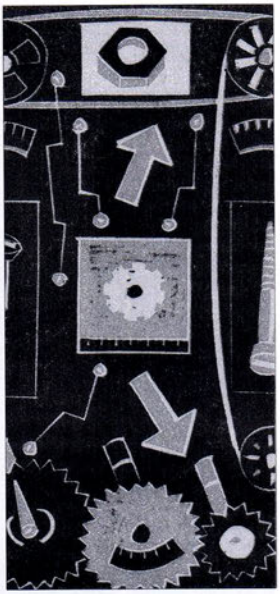
Anyway, back to the Arm. When it processes an instruction, it grabs a whole 'word' instruction and examines certain bits (in both senses of the word) to see what sort of instruction it is dealing with. For example, if bits 26 and 27 are clear (0), then the instruction is a simple data processing instruction such as MOV, ADD or RSB.

With this in mind, the Arm can then make sense of the rest of the bits. Certain bits have a fixed meaning: bits 28 to 31 are the condition code (more about these later in the series) but others will vary according to the initial 'class' of instruction. The important upshot of all this is that all parameters for instructions have to fit within these 32 bits, hence you cannot supply a full 32-bit number to MOV and so on.

In fact, as you are allowed to supply a constant on the end of an addition: ADD R0,R4,#64. As well as the '64', those 32 bits have to store the fact that: you have specified ADD; you are using R0 and R4 and condition code mentioned earlier, as well as a couple of other twiddles which I will come to later.

From the grand total of 32, this leaves only 12 bits to specify the constant. Rather than doing the obvious, and making these 12 bits bits 0 to 11 of a 12-bit constant (which would only allow the numbers 0 to 4095), Acorn splits the 12 bits into two fields, one eight-bit constant and one four-bit 'shift'.

The shift is how many bits the eight-bit constant is offset. This is the computer's way of thinking about it – mathematically, the value represented is: $value \times 2^{(2 \times shift)}$. So, with a shift of zero, you can represent the numbers 0 to 255; with a shift of one; the numbers, 0, 4, 8, 12 . . . 1020; with a shift of two, the numbers 0, 16, 32 . . . 4080 and so on.



YELLOW PAGES

To find the programs mentioned in this article, please turn to the yellow pages, under the section entitled Arc Assembler. They can also be found on the subscribers' monthly disc.

Unfortunately, I have to admit that this is a bit of fib – the shift value doesn't really work in this way. It is actually an offset in the opposite direction, so my shift of one above is actually stored internally as 15, two is represented by 14, and so on. A 'real' shift of one moves the value right and off the bottom of the 32 bits available.

But it doesn't just fall into hyperspace – bits 0 and 1 'wrap round' and become bits 30 and 31. A shift of four moves the value eight bits to the right, thus all the bits wrap round, allowing you to access the 'top byte' of the 32-bit word. Luckily you never need to worry about the way constants are stored within the instructions, since the assembler does all the work of converting your number into the necessary eight-bit value and four-bit shift.

If a constant you give cannot be converted, you will get an error such as 'Bad immediate constant'. Therefore all values 0 to 255 are fine (they are all eight-bit numbers anyway), 256 is fine because only bit eight is set (to 1) so it can be converted, however 257 cannot. Both bits 8 and 0 are set, so the 'value' cannot be represent by an eight-bit number.

The more astute of you may have noticed that because only four bits are available for the shift, only 16 'positions' are available for the the value field. Because of this, numbers such as 258 cannot be represented.

Although the 'width' of the number is only eight, (so bit 8 and bit 1 are set) only one position of shift is needed, which cannot be represented with one of 16 positions available. However, 516 *is* allowable since an actual shift of two (shift field=15, remember) can be used with a value field of 129.

Although this system of value and shift offers a more limited range of 'small' numbers, it has the major advantage of allowing a reasonable range of 'large' numbers to represented as well. Powers of two are often used within programs for a number of reasons and, as these have only one bit set, all 32 of them can be represented.

BENEFITS

The even more astute of you will have realised that numbers less than eight bits 'wide' can be represented in a number of ways: two, for example, could be two with a shift of zero or one with a shift of 15 – this is the inevitable redundancy of this system, but I think you'll agree the benefits far outweigh the problems. Listing two shows some examples of larger numbers. You won't be able to run this program as one of the lines causes an error – can you guess which one?

One final point relating to negative numbers, '-1' in binary is represented by all 1s (see last month's article). Fairly obviously, this is 32 bits 'wide' and therefore cannot fit into an eight-bit value field. By using the ones complement method, -1 becomes 0 which, as we all know, will easily fit into eight bits.

Next month I will look at the final instalment of MOV and explain what you do if you really *do* want to load 258!

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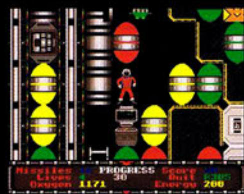

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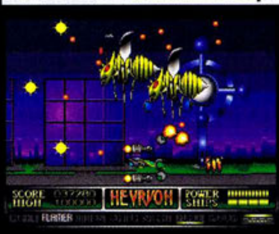
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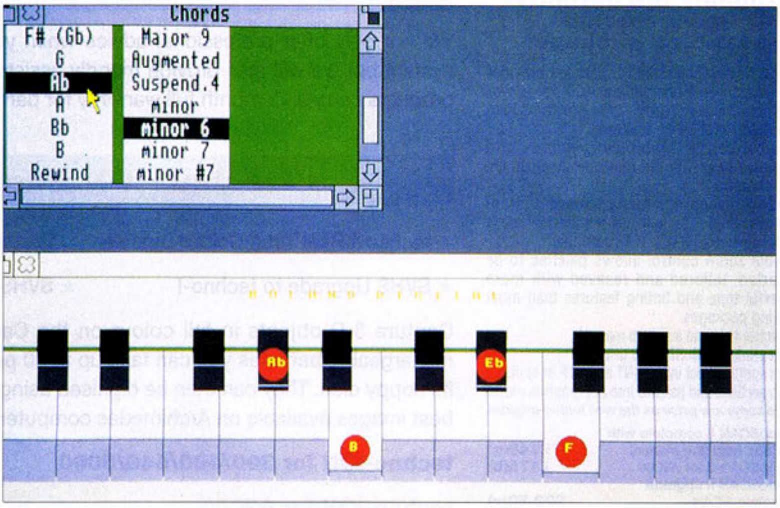

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WIN A MUSIC KEYBOARD SEE PAGE 120



Learn all about musical harmony, with **PAUL MARSHALL**'s chord dictionary

STRIKE A CHORD

It is common knowledge that playing a one-fingered tune on a piano sounds pretty boring. To make a tune come alive you need to play a few well-chosen notes at the same time – notes which harmonise with the main theme.

Anyone who plays the piano will know that certain notes, when played together, form a chord. In published sheet music the accompaniment harmony is often shown using chord symbols. Guitar players are lucky – they sometimes even get a little drawing which shows them where to put their fingers.

Some years ago, when I felt that the world badly needed another guitar player, I learnt all the chords I needed using songbooks and diagrams in a chord dictionary. More recently, when I wanted to learn chords on a musical keyboard, I decided to enlist the help of my computer. Hence the birth of *Chords*.

The application *Chords* is a chord dictionary with built-in sound, but it also has a simple sequencing feature. Even if you are not learning to play, just listening to the different chords and the way they work together can be fascinating.

YELLOW PAGES

As usual, this program is free to subscribers on the monthly disc, in both eight-bit and 32-bit versions. If you do not subscribe, you can still type in the program by turning to the Chords section in yellow pages.

The 32-bit user should type in listing one and save it as !Runimage in a directory called !Chords. Then create a Mode 12 sprite in Paint called !Chords, with the dimensions 34×17 and save it inside the !Chords directory as !Sprites. Using Edit create an Obey file and enter the following text.

```
|!RUN for Chords
WimpSlot -min 80K -max 80K
RUN <Obey$Dir>.!RunImage
```

Save this Obey file as !Run inside the !Chords directory. Now double clicking on the !Chords icon in the directory viewer will run the application. Eight-bit users should type in listings three and four and save them as Chords1 and Chords2. Then CHAIN"Chords1".

USING THE PROGRAM

The program installs on the icon bar in the usual way. Clicking select over the icon brings up two windows: one contains the music keyboard, the other the selection menus.

On the left are the 12 basic chord names from C through to B, plus control of the sequencing. In the centre there are 15 chord forms: the basic major and minor triads – triad means three notes – and a selection of higher forms. (If you are a bit hazy about your harmonies, then take a look at our box called natural progressions.)

Select the chord name, form and position from the menus, and the keyboard window will show which keys to press and what the notes are called. Meanwhile, the chord is played through the computer sound system and through a Midi interface and keyboard, if one is connected. Pressing Adjust makes a selection without running the demonstration.

Notes played on a Midi keyboard are also shown on the display so the player can confirm the correct fingering. However, don't play lots of notes very fast as this may leave the program behind and fill up the Midi buffer.

Each time the mouse is clicked on Play seq, the next chord in a predetermined sequence is played. To enter a sequence, click over enter to reveal a line of text which can be edited in the usual way. Rewind puts the sequence pointer back to the start and Help displays a reminder of the sequence notation.

When the Arpeggio option is ticked, chords are played with a delay between each note. This is not a true arpeggio but it makes the individual notes easier to hear. Delay sets the delay in centi-seconds – from five to 100 is reasonable.

THE LISTING

In the 32-bit version, the Wimp routines are fairly straightforward, with windows and menus defined within the program. The keyboard graphics are drawn by PROCdraw_screen and PROCplot (which draws one key only), by first calling PROCbackgnd to direct all VDU driver output to a background sprite. The usual drawing commands are then used without having to refer to window co-ordinates. PROCforegnd then directs output back to the normal screen. When the

window manager calls for a re-draw, the whole sprite can be quickly plotted at the appropriate screen co-ordinates. If the user decides to changes desktop mode, while the program is running, then PROCdraw_screen redefines and re-draws the sprite.

The selection window is constructed entirely from icons (this method allows faster access than Wimp menus). The window manager numbers the icons in the order that they are defined, so there is no need to save the icon handle returned by SYS"Wimp_CreateIcon". To determine what name, form or inversion has been selected, PROCprocess_icons merely checks icon% against a range and subtracts an offset.

The presence of an Acorn-compatible Midi interface is detected in FNmidi by setting a local error trap and then attempting to make a Midi SWI call. The note number to send to Midi is K%+59, where K% is the key from 1 to 24. Change 59 to 47 to drop the sound one octave.

The data defining each chord is stored at the end of the program. For each form the root position is given first, then the three inversions, then the name for use in the menu. Our 24-note keyboard is numbered from one to nine then A to N, where 1 represents low C, 2 is C# and so on. Only chords in the key of C are stored; other keys are derived by adding an offset.

A more elegant approach would be to take the basic triad and alter or add to it, according to a formula. A whole range of altered chords could then be produced quite easily. Some notes have different names but sound the same, for instance C# and Db. Logic in PROCplay determines the appropriate name to print on the keys but it is not always grammatically accurate – another reason why the chord data would be better derived from a formula.

FNtoo_high checks if any note would be beyond the top range of the keyboard, in which case the whole chord is moved down by an octave. PROCplay_sequence processes the sequence text using INSTR to match the letters entered with those valid. No error checking is performed here. An unrecognised entry will default to a C or a major chord, depending on where the error is. You may need to alter *TUNING 80 in PROCinit_prog to adjust the pitch of your micro.

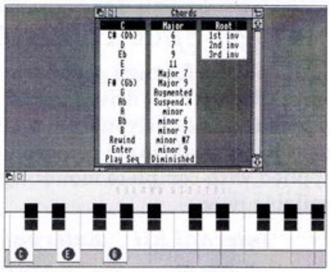
EIGHT-BIT VERSION

The eight-bit version works in a similiar fashion. Selection is made using the cursor keys, a tick indicating the selected item. RETURN plays the chord and SPACE steps through the sequence.

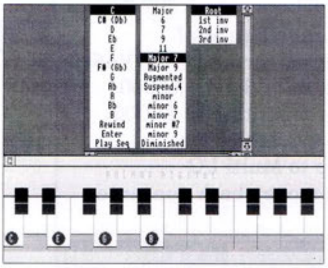
Pressing f0 allows the sequence to be edited. Insert editing is provided, using CURSOR LEFT/RIGHT, and DELETE. Press RETURN when it is finished. As there are only three sound voices and many chords have four notes, notes are played one-at-a-time in arpeggio style.

The program is in two parts. Chords contains instructions and sets PAGE to &1300 ready for Chords2. Data format is the same as for the 32-bit version, but there is only room on the screen for 14 chord forms, so the minor#7 has been omitted. To save space, the sequence string is indirected by seq% to &A00. No Midi output is provided but could be added as indicated in PROCplay. Midi input is not included but a routine similar to PROCmidi_in could be added.

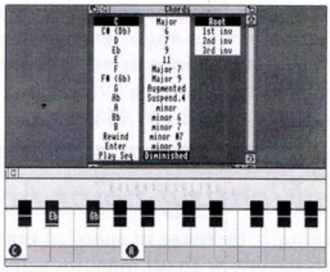
NATURAL PROGRESSION



The chord table below describes how to enter the traditional chord symbols into the program. (It uses the key of C as an example.) You can see that on the right of the program menu there are four positions: the root plus the first, second and third inversions. The note that the chord is named after is known as the root of the chord. (Moreover, in a root chord – shown on the right – this note is also the lowest note in the chord.) Inversions are a re-arrangement using the same notes, but where the root is not the lowest note. To try out progressions, in other words a sequence of chords that lead naturally from one to another, the sequence option can be used. Chords built on F and G follow on from C pretty well. Numerous songs have been written with just C, F and G, known as the three chord trick, and some rock groups, such as Status Quo, have built whole careers playing little else.



The tricky bit is to find a sequence which progresses smoothly and at the same time harmonizes with a complex melody. Each chord form brings a different quality or feel to the music. A major chord has an air of finality: indeed, most tunes end on the major chord of the key. A chord like C7, however – shown on the left – lends a feeling that there is more is to come and so this type of chord is often found in songs at the end of a phrase or sentence. Play C7 and hold on to it for several seconds. The ear feels uncomfortable. Something should happen. Now play F Major. The ear is satisfied. The C7 chord has resolved on to the F Major. Sharpening the fifth (that is, the fifth note up from the root) of a major chord gives an augmented triad, which tends to resolve on to a chord with a root a fourth above it's own, (try C plus F). Any note of the augmented can be the root and this applies also to the diminished chord. Compare Co Ebo F#o Ao with Co 1Co 2Co 3Co.



To hear a diminished chord at work, try C Co Dm7 G. Here, the diminished (see right) resolves into a minor, and the minor to G Major. Notice how it sounds unfinished. Following on with the reverse, G Dm7 Co C gives a complete progression, but the two Gs together sound dull. Would Gsus4 be better than the second G? The minor sharpened seventh (m#7 for short) is an example of an altered chord that definitely belongs in a mystery movie! Inversions, although containing the same notes, don't always have precisely the same effect. C major in the 1st inversion doesn't sound quite as final as the root position. Play C Major seventh (Cm7) in the root position and the notes look evenly spaced. Move to any of the inversions, and B and C pop up next to each other. Being adjacent, they sound discordant on their own, but in harmony with E and G, the sound is, well... judge for yourself!

CHORD TABLE

FORM	CHORD SYMBOL	ENTERED AS
Major	C	C
Minor	Cm or CMI	Cm
Seventh	C7	C7
Major seventh	Cmaj7 or CMA7	CM7
Minor seventh	Cm7 or CMI7	Cm7
Minor sharpened 7th	m#7 or m(+7)	Cm#7
Augmented	Caug or C	C+
Diminished	Cdim or Cdim7 or C°	Co
Suspended forth	Csus or Csus4	Cs or Csus
(substitute 6,9,11 for 7 as required)		

★INFO

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COMPATIBILITY KEY

- **B** BBC B compatible
- **B+** BBC B+ compatible
- **M** Master compatible
- **C** Master Compact compatible
- **E** Electron compatible
- **A** Archimedes compatible
- BBC A3000 compatible

★PRIZE £25★

A TIGHT FIT

Laurie Jones of Bedford continues our curvy theme this month with *CurveFit*. This is a program which uses an iterative procedure to reduce the size of a formula which represents a curved line. Using an expression of x with two parameters, a and b it will fit any two parameter function of x. The menu gives a selection of functions which have proven useful, but allows the entry of any expression in the correct form: for example, $y = a + b / X$ or $y = a / (1 + b^*X)$.

The usual method is to transform the data into a linear form and then to perform a linear regression. Unfortunately this gives unequal weightings to the data points, depending on the transformation used. By using the speed of the Archimedes to perform simple iterations, you can avoid the use of sophisticated curve-fitting algorithms for non-linear data, provided the theoretical curve is known. The basis of this program is sequentially to optimise the values of the a and b parameters, starting from initial 'guessed' values (the default value is one).

The x,y data set is read into an array, and the calculated value of y is found for each value of x. The observed y value is subtracted and the result squared. The squared values are summed for each x,y pair to give the initial sum of squares. The value of a is then decreased by 10 percent and the process repeated. If the sum of squares has decreased, a is again reduced and the process repeated. (Otherwise the direction of change in a is reversed and a is increased.)

This process is repeated until the sum of squares again increases. The direction of change is then reversed and the step size reduced to 1 percent. The iteration continues until the next overshoot; the step size is reduced to 0.1 percent and direction reversed again. This process continues until the step size is 0.00001 (which can be altered at will).

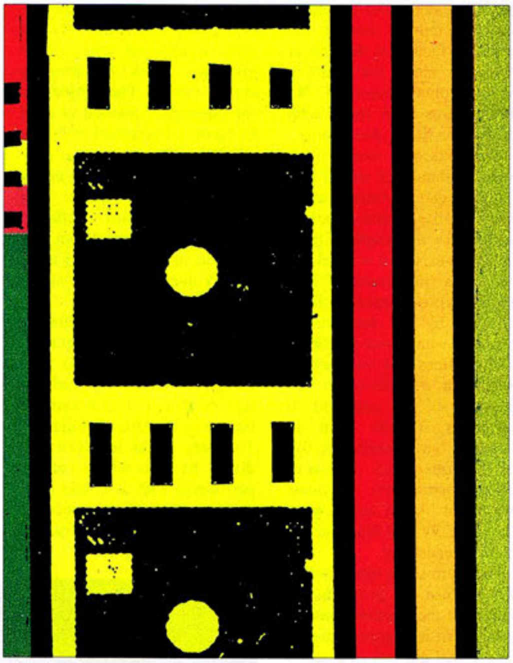
```
; >Test
This is the heading
Label for X
Label for Y
0,0
10,20
20,30
30,35
40,37.5
50,38.75
```

Example data for curve fitting

The same procedure is then run to optimise b. The cycle of optimising a and b alternately is continued for 50 cycles or until the ratio of the sum of squares of y on successive cycles is between 1.00001 and 0.99999 (again arbitrary). In principle the same system could be used to fit a third parameter, but the fitting process would be very slow.

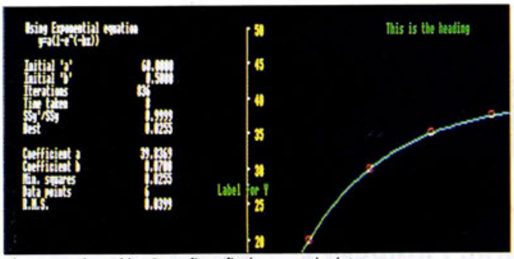
The data should be stored in a previously prepared data file – the required format of the data file is described later. Once the data file has been read, the program plots out the data points on automatically scaled axes and then presents a menu containing a set of curve options, plus an option to enter any other function of x in terms of a and b. The iteration then proceeds, is monitored by a counter and timer, and the display of the ratios of successive sums of squares.

Provided the curve chosen is appropriate to the data, and sensible a and b values were



★INFO COMPATIBILITY TABLE

LISTING	NAME	BBC B	MASTER	ELECTRON	ARC
Info 1	CurveFit				★
Info 2	Bezier8	★	★	★	
Info 3	BezDemo	★	★	★	★
Info 4	Toner27				★
Info 5	Point32				★
Info 6	Cube				★
Info 7	Hypno32				★
Info 8	Hypno8	★	★	★	★
Info 9	!Runimage				★
Info 10	Mortgage	★	★	★	★
Info 11	MindMaster2	★	★	★	★
Info 12	Scribe				★



The curve plotted by *Curvefit* to fit the example data

chosen, the iteration takes a few seconds to a minute or so, depending on the amount of data to be fitted.

The program then prints out the values of *a* and *b* and the function fitted, together with the residual sum of squares about the fitted line and the root mean square. The curve of best fit is then drawn on the plot of the original data points. By using a Mode 16 screen, it is possible to show the curve parameters and the fitted line on the same screen, and print it out if required. Next, an analysis of variance is produced, showing the total sum of squares for *y*, the sum of squares accounted for by the regression, and the residual sum of squares.

The variance ratio, *F*, gives an estimate of the significance of the fitted line for the number of degrees of freedom in the data. If the curve fitted was a straight line then the regression coefficient *r* is printed.

The main use of the program is to fit calibration curves to biochemical data and then to use these curves to calculate the concentrations of test samples. In setting up the calibration curve a set of samples of known concentration are used, and appropriate instrumental readings taken (for example, colour measurements, meter readings and radioactive counts).

The concentrations are plotted on the *x* axis, and the observed readings on the *y* axis. Once the curve is established, the values obtained from test samples are read, and the concentration determined from the calibration curve.

Although this would not be the method of choice for performing linear regressions, comparison with the standard method gives the same values for the slope and intercept, and the same residual sum of squares to three or four decimal places, and could be made closer by increasing the number of iterations (modify the value of 'factor' at the end of PROCiterate and/or the limits at the end of PROCoptimise). No checks have been made with other curve fitting procedures.

As mentioned, data for the program should be stored in a file. This can be created using *Edit*. The file should contain a heading for the graph, a label for the x-axis and a label for the y-axis (maximum of four characters) on separate lines followed by the data in the form of *x,y* pairs, one per line.

Blank lines and lines beginning with a semi-colon are ignored, so you can add in comments if you want as shown in our example file (on the previous page). If you're feeling particularly unctuous you might like to SetType your file to a CSV and load the file into a spreadsheet!

There are some datasets that will confuse the program, especially if the function you are trying to fit is inappropriate, or the original guesses of *a* and *b* were a long way out.

For some functions of *x*, it will find false optima, where the sum of squares seems to be at a minimum. In these cases an obviously silly line may be plotted. In particular, re-entrant functions such as parabolas or trigonometric functions (sine or cosine etc) seem to confuse it.

You can speed up the iterations by omitting the monitoring of the process – there are two calls to PROCmonitor in PROCoptimise. It is quite fun to watch the successive attempts at fitting the curve by putting in an extra call to PROCdraw in either the PROCoptimise just after optloop+=1. To really see what's going on, you could try adding a call within the REPEAT loop of PROCiterate, but it will drastically slow things down!

★PRIZE £50★

FAST CORNERING

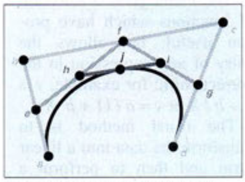
Our coveted star prize this month goes to **David Breakwell** of Addlestone. Prompted by the *Pieces of Eight* revival of Bezier curves (*BAU* December 91), he has rattled off a speedy curve plotter for eight-bit machines. As you may or may not know, there are two ways of drawing Bezier curves. The simplest is the parametric method as used by George Blanchard in *Pieces of Eight*. This is a nice, concise method that can be easily translated into Basic and involves a third variable, usually *t*, that varies from 0 at the start of the curve to 1 at its end. Values for both *x* and *y* are calculated from *t*.

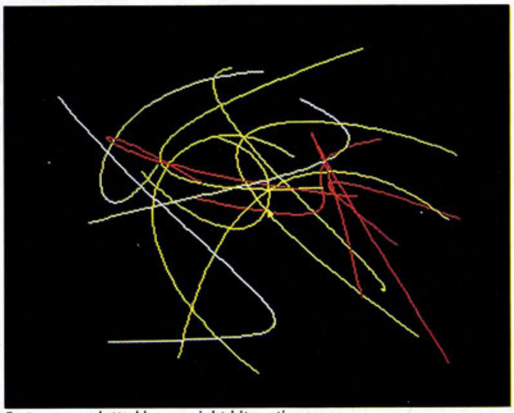
Another way of plotting Beziers is to use a recursive sub-division or 'divide and conquer' method. The advantage of this is that it can use integer arithmetic throughout. The only maths involved is a divide by two which can be performed with a simple right shift on the 6502 processor. The recursion works according to the following rules.

'To plot a Bezier curve using points *a, b, c* and *d,* where *a* and *d* are the start and end points and *b* and *c* are the two control points, calculate the mid points of *ab, bc* and *cd* (call these *e, f* and *g*). Then calculate the mid points of *ef* and *fg* (*h* and *i*). Finally calculate *j*, the mid point of *hi*. Then plot the two 'sub' Bezier curves *aehj* and *jigd*. This should, of course, be done recursively.'

Our diagram below should make this clear. To stop the recursion a 'depth' should be passed down the calls and once this reaches a predefined level, the straight line *ad* will be drawn instead of recursing. Alternatively, and more efficiently, a quick check could be made at the start of the routine on the length of this line segment and the recursion then only takes place if is is longer than, say, four pixels.

We've knocked up a demonstration, entitled *BezDemo,* that plots a curve using parametric and recursive methods.

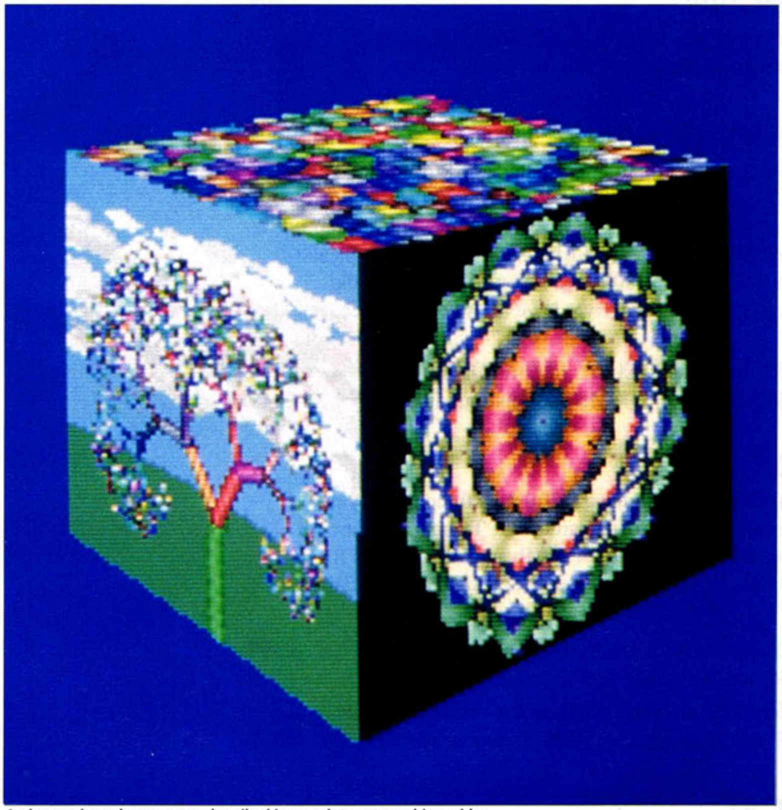

Drawing a bezier curve using a recursive sub-division method. All points e-j are mid points. Each subdivision generates one more point (j) that is guaranteed to be on the curve.


Fast corners plotted by our eight-bit routine

As David's machine code version uses operating system VDU calls to do the plotting, it will work on any eight-bit machine in any mode, including shadow modes. This does, of course, mean that it might not run as fast – directly accessing the screen memory would be quicker – but it does remove the need for complicated bounds checking for the edge of the screen and graphics window. Also it makes this version independent of screen mode.

David has included a short demonstration of his code in the listing, that merely plots random curves. From this demo, the way that you use the program should be fairly self-explanatory.

For curiosity value only, he has also sent in a routine that renders Risc OS Draw files on a BBC. For those interested, this can be found on the monthly subscribers' disc. Needless to say, it doesn't handle line widths, filled shapes, colours, text, sprites...



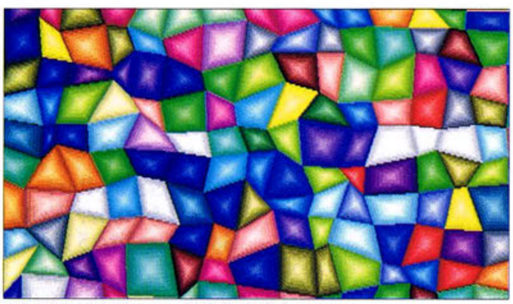
An impressive cube program: described in our plot spot graphics guide

★PRIZE £20★

UNITED COLOURS..

Jan Vibe, was the author of *Fire* and *Spikes* (*BAU* March 92) and Jan returns this month with a very nice seven line procedure for Arc users. The offering called *Toner27* generates eight shades of 27 colours in 256 colour modes. The layout of the 256-colour palette is the bane of many peoples' lives, so it's nice to see a short way of making sense of all those hues!

Jan has provided four routines, by way of demonstration and he earns a fiver for each! Oh, and by the way, you'll need to save the output from three of these routines for Mr Acton's *Cube* further on, so be sure to press S when the program boots between each section. Incidentally, when you run the program, there is one example of a recursive flower, which you have to stop by pressing SPACE.



Colour plotting made easy with the Toner27 routine

PLOT SPOT

From our reader survey it seems that many of you would like some back-to-basics stuff, to assist you with Basic and machine-code programming. We'll try to respond as best we can to these and other comments from the survey in future issues. **M J Ballinger** of Cirencester has asked how to plot a point on the screen of an Archimedes using machine-code. This being the basis of literally dozens of items in past ★INFO articles, we thought it would be a good point to kick off with, so have a look at *Point32*.

You can plot points using the Basic keyword POINT or by using 'official' calls. However, it is much quicker to 'poke' points directly into the screen memory. The screen of the Archimedes is arranged very simply and 256-colour modes

		Columns			
		0	**1**	**2**	**3**
Rows	**0**	0	1	2	3
	1	320	321	322	323
	2	640	641	642	643
	3	960	961	962	963

Layout of the Archimedes' mode 13 screen memory

are particularly easy to deal with. This is why so many of our demos run in modes 13 or 15 and *Point32* uses a 256-colour mode for precisely the same reason.

That reason is that in mode 13, for example, each point on the screen is represented by a single byte. You simply choose the colour you want from the 256 available, work out which byte you want to poke and put that value there. Each row of pixels

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(starting with the top one) consists of a block of consecutive bytes of memory as shown in the previous diagram.

In mode 13 there are 320 pixels across the screen, so the top row occupies bytes zero to 319 of screen memory. The next row follows on directly from this, so it takes up bytes 320 to 639. The next uses 640 to 959.

Unlike the BBC however, it is not always obvious where the screen starts in memory. It depends on how much of your machine's Ram is allocated to the display. There is a call which allows you to find the address of the top left corner of the screen though (column zero, row zero in figure one) and this is OS_ReadVduVariables.

It takes two parameters – the first points to a list of numbers terminated with one. The numbers are the codes for the VDU variables you want to read.

Code 148 means the start of screen as used by PLOT and DRAW. The second parameter points to where you want the values returned to be placed. It may be the same place, as in the example, if you're only going to read them once.

The plot routine in the example is called .plot and takes three parameters. In registers R0 and R1 (taken from A% and B% in Basic) are placed the co-ordinates of the point to plot. Note that these are not OS co-ordinates but 'raw' values (x in the range 0-319, y in the range 0-255). The colour to plot is passed in R2 (C%). To calculate the screen address, we use the simple formula: *address = base + y × linelength + x*.

The value base has been read with OS_ReadVduVariables and linelength is 320 for mode 13. We could use a multiply instruction to calculate the address of our pixel, but because 320=256+64, we can use two shifts instead and this will be much quicker. Also, we don't need to add on the x because we can incorporate this into the STRB instruction that places our colour on the screen. The example plots a line of randomly coloured points by repeatedly calling .plot. For speed, you would normally reserve a register to permanently hold the start of screen address, so it need not be reloaded each time.

Having looked at machine-code graphics at their simplest, let's take a bit of a leap and see what else can be done. *Cube* uses the same principles as *Point32* – mode 13 is used for speed and simplicity.

Three pictures are loaded and then mapped on to the surfaces of a rotating cube. Since it was readily available, we have used the output of Jan Vibes' *Toner27* and saved them as mode 15 screens with the names *pic_tree*, *pic_flower* and *pic_tiles*. Alter the listing if you want to use other sprites – any 256-colour ones will do, whatever their size.

The program uses a cheat to perform the 'squashing' of the sprites into arbitrary quadrilaterals. The technique is fast and simple, and convincing enough if the sprite is not stretched too wildly! Our example shows the basic idea, with a sprite ABCD being mapped on to A'B'C'D'.

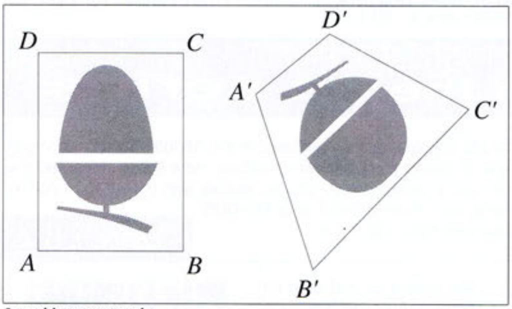
To do this properly would mean applying a transformation to each pixel in turn and this would take many seconds. Instead, we find the lowest point in A'B'C'D' – B' in fact. Then we move up the shape a row at a time. With each row we see how far along B'A' we are, and how far along B'C'.

We then mark points with the same proportions along BA and BC and draw a line between them. Finally, we simply take this line and stretch it or squash it, so that it fits on the current row we are plotting, then move up another line and repeat the process.

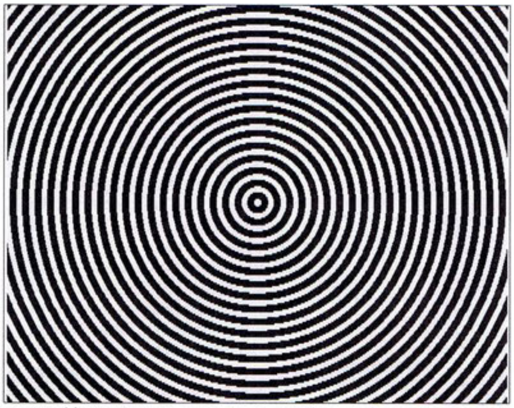
Eventually we reach the row that C' lies on. We take note of this and continue upwards. We're still moving along B'A' on the left, but are now moving along C'D' on the right. Again, we take points from the original shape that are the same proportions along BA and CD, draw a line and map it on to our new shape. A little further up we encounter A' on the left, so start moving along A'D' on that side, continuing along C'D' on the right. Finally we reach the top.

Because we're plotting actual rows on the screen, we can use fast store and multiple-store instructions. Also, because we are only concerned with each point on the final image, holes will be filled in if the image is bigger than the original and smaller versions will be plotted more quickly.

The cheat becomes apparent if you stretch one corner a great deal – a fold will appear in the image. The picture is not really treated as a single piece of rubber (which would be ideal) but as several pieces joined together. Still, the effects are good enough, and the speed is sufficiently fast to make the routine useable in real-time.



Squashing a rectangle


BAU Health Warning: not a program to run when you have a hangover

★PRIZE £10★

LOOK INTO MY EYES

B B+ M C E A

This program was an absolute hit in the *BAU* office. It's a one-liner from **Richard Boakes** and it shows you just what a strange effect your own eyes can produce. *Hynpo* (there are two versions: one for eight-bit and another for 32-bit machines) draws a pattern of concentric circles – alternately black and white. These are then animated so the pattern appears to move inwards. 'Stare at the centre for 15 seconds or more' says Richard, 'and watch your eyes play tricks on you. Look around the room!'

★PRIZE £25★

UPTIME

A

Have you ever wanted to know if someone has been tinkering with your machine while you've been out? Or have you ever wanted to know how long you use your machine a day? **Ron Wardenier** from Drachten in the Netherlands has sent in a handy little application that sits in your boot up sequence and keeps a track of exactly

```
| > !Boot
| !Boot file for UpTime
| By Ron Wardenier
| (C) BAU April 1992
|
IconSprites
<Obey$Dir>.!Sprites


| > !Run
| !Run file for UpTime
| By Ron Wardenier
| (C) BAU April 1992
|
IconSprites
<Obey$Dir>.!Sprites
Set UpTime$Dir
<Obey$Dir>
Set UpTimeFlag ?
RMEnsure UpTimeLogger
1.00 Set UpTimeFlag Off
If UpTimeFlag="Off" Then
Run
<UpTime$Dir>.!RunImage
Unset UpTime$Dir
Unset UpTimeFlag
```

!Boot and !Run files for UpTime

that. *UpTime* keeps a record of when you have used your Arc and can also be used to detect usage of the given Arc in your absence. However anyone who is able to manipulate text files could cover their trail, so be warned! Once installed and included in an autoboot sequence, *UpTime* is completely transparent.

Recording the time of starting work is quite easy. Just after switching on – or going up as we will call it – *UpTime* is run as part of the autoboot sequence. As well as other actions, *UpTime* then reads the RTC (Real Time Clock) and writes it's value to a file. This file called *UpTimeLog* acts as a simple kind of logbook.

Not surprisingly, the time of going down (in other words, switching off) is not as easy to record. If you are very disciplined you could write some kind of closing down sequence and execute it every time you stop work. Part of such a sequence could be a program that writes the RTC-time to the file *UpTimeLog* but, of course, it is far more convenient to have the time of going down recorded automatically.

To achieve this, *UpTime* continuously writes the time of the RTC to Cmos Ram. The data in Cmos Ram is preserved by battery when the Arc is off. So, at the next time of going up *UpTime* reads the time in Cmos Ram and writes it to the file *UpTimeLog*. This time represents the time of going down because it was the last one written in Cmos Ram.

To reduce the load on the processor, writing the RTC time to Cmos Ram is limited to once a minute. By doing so, the resolution of the recorded time is also one minute. Care is taken to perform proper rounding off when converting centiseconds to whole minutes. Again, to reduce the processor load, no use is made of Wimp_Poll or Wimp_PollIdle.

The Wimp desktop polling mechanism is not used for two reasons. Firstly, the writing to Cmos Ram would grind to a halt if you left the desktop. Secondly, general polling is a rather inefficient method. Risc OS itself provides the perfect solution by means of a couple of SWIs, namely OS_CallEvery and OS_RemoveTickerEvent.

OS_CallEvery is used to install an interrupt routine on a timer chain. Once installed, the routine is called repeatedly after every fixed time interval. OS_RemoveTickerEvent is used to remove the routine from the timer chain. *UpTime* uses OS_CallEvery with a time interval of 6000 centiseconds (one minute). In this way, once a minute, action is taken in the form of writing the RTC-time to Cmos Ram and the Arc is not slowed down by running yet another desktop task in the background.

In Cmos Ram, the locations 30 to 45 are reserved for the user. The time and date of the RTC can be stored as a five byte value. Obviously, claiming five of the sixteen locations available is too much. Instead of storing the absolute time and date, a relative time is used which requires only two locations in Cmos Ram. With the minute as a unit of time, just over six and a half weeks can be stored in these two bytes. Anything relative must be fixed to something absolute. In this case the relative time starts ticking from a reference time.

To allow the RTC to be set a little backwards, the reference time is the time of going up, minus one week. As a consequence, the maximum period of staying up, in which all timekeeping makes sense, is limited to about five weeks. There is no need to worry should this period be exceeded since nothing dramatic will occur. Everything will go on except the time of going down will be calculated incorrectly as the reference time will no longer be valid.

The part of *UpTime* responsible for updating the Cmos Ram every minute, is held in a relocatable module called *UpTimeLogger*. This module is assembled every time *UpTime* is run, because the reference time must be known to the code in order to convert the RTC time to the two-byte relative time.

Therefore, the module is not saved to disc but transferred directly to the RMA by using OS_Module with R0 set to 11. The module help string contains the date of assembly but the version string stays fixed to one. The figures on the previous page contain the *!Boot* and *!Run* files and should be entered using *Edit* and saved in a directory called *!UpTime*. The main listing, *!RunImage*, is on the yellow pages. You will also need to create a suitable sprite with *Paint* and save it in the *!UpTime* application directory. The actual logbook file *UpTimeLog* and the reference file *UpTimeRef* are not listed. These files are created and updated by the application.

★PRIZE £15★

SPYROGYRA

Scribe has come all the way from sunny Australia, **Sam Watkins** of Victoria to be precise. The function, operation and results of Sam's program should be self explanatory: the program as listed has been tweaked a bit from Sam's original. His version flickered quite badly as he only used one screen bank, but note the horrible contrivances (especially in PROCdraw) needed to make it work with two! Multisync owners may like to change the MODE 15:MODE 12 to MODE 21:MODE 20.

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MASTERMIND TWO

In January's ★INFO, we carried a neat little Mastermind program by J A McHugh. We also asked if any bright reader could come up with a good computer-play routine. One who did is **Malcolm Gray** and we've merged his thinking routine with J A McHugh's original to produce a complete game. You can now take turns with the computer, guessing its randomly chosen code and then choosing a code of your own for it to work out. Although it may be tempted, the computer doesn't cheat and instead uses a 'brute force' method to work out your combination. Essentially, all possible combinations are stored in an array and are 'crossed off' if they contradict the results of previous guesses.

The computer usually manages to get the right answer within eight guesses and a score is kept. Ten points are awarded for guessing at the first attempt, nine for two guesses, eight for three and so on. You might like to enhance the thinking process by adding a random element. Currently, the computer will always choose the same strategy, so if you discover a code that it has trouble with, it's up to your good sportsmanship not to repeat the formula in every game!

*QUIT

Please send any submissions to us at the following address: ★INFO, *BBC Acorn User, Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ*. Programs should be on disc with a description of their purpose and operation. A stamped addressed envelope with your submission will ensure the return of your disc.

Dave Lawrence
Dave Acton

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★Info												
Info 1								■	■		■	■
Info 2-3		■	■	■	■	■	■	■	■	■		■
Info 4-7								■	■		■	■
Info 8		■	■	■	■	■	■	■	■	■	■	■
Info 9								■	■		■	■
Info 10		■	■	■	■	■	■	■	■	■	■	■
Info 11		■	■	■	■		■	■	■	■	■	■
Info12								■	■		■	■
Facebender												
Face 1-2								■	■		■	■
Face 3-5		■	■	■	■	■	■	■	■	■		■
Chords												
Chords1								■	■		■	■
Chords 2-3		■	■	■	■		■	■	■	■		■
Arm Programming								■	■		■	■

★Info

Listing 1

```
   10 REM >CurveFit (Info1)
   20 REM By Laurie Jones
   30 REM For RISC OS machines
   40 REM (C) BAU Apr 92
   50 :
   60 ON ERROR VDU4:CLOSE#0:ORIGIN 0,0:S
YS "Hourglass_Off":PRINTREPORT$;" at lin
e ";ERL:ON ERROR OFF:END
   70 MODE 16
   80 VDU 24,43*16;0;132*16-1;1023;
   90 PROCreadequations
  100 DIM data(100,2)
  110 PROCloadfile
  120 VDU 28,0,31,42,0
  130 eqn=0
  140 PROCaxes
  150 PROCplot
  160 PROCchoice
  170 CLS:CLG
  180 PROCaxes
  190 PROCplot
  200 PROCguess(eqn)
  210 VDU 30
  220 CLS
  230 PRINT "Using ";
  240 IF eqn=0 PRINT"'other'"; ELSE PRIN
T name$(eqn);
  250 PRINT" equation"
  260 IF eqn=0 PRINT"   y=";y$' ELSE PRI
NT"   ";eqn$(eqn)'
  270 PRINT"Initial 'a'";FNform(a)
  280 PRINT"Initial 'b'";FNform(b)
  290 oldsq=FNssy(a,b)
  300 maxsq=oldsq
  310 TIME=0
  320 OFF:SYS "Hourglass_On"
  330 PROCoptimise
  340 SYS "Hourglass_Off"
  350 PROCdraw(a,b,scalex,scaley)
  360 PROCoutput
  370 PROCstats
  380 END
  390 :
  400 DEF FNerror
  410 IF ERR=18 OR ERR=22 I=I+1:=TRUE
  420 PRINT REPORT$;" at line ";ERL
  430 =flag%
  440 :
  450 DEF PROCaxes
  460 LOCAL x,y,i
  470 VDU 5
  480 ORIGIN 800,110
  490 GCOL 7
  500 LINE 0,0,1100,0
  510 LINE 0,0,0,900
  520 x=INT(FNmax(1))
  530 y=INT(FNmax(2))
  540 IF x=0 x=1 ELSE scalex=INT(LOG(x))
+1
  550 IF y=0 y=1 ELSE scaley=INT(LOG(y))
+1
  560 scalex=INT(10^(scalex))
  570 scaley=INT(10^(scaley))
  580 scalex=scalex/INT(scalex/FNmax(1))
  590 scaley=scaley/INT(scaley/FNmax(2))
  600 FOR i=1 TO 11
  610 GCOL 7
  620 MOVE 110*(i-1),0
  630 DRAW 110*(i-1),8
  640 MOVE 110*(i-1)-20,-25
  650 GCOL 3
  660 IF eqn=5 PRINT INT(10^(scalex*(i-1
)/10)) ELSE PRINT scalex*(i-1)/10
  670 GCOL 7
  680 MOVE 0,i*90
  690 DRAW 8,i*90
  700 MOVE -100,i*90+8
  710 GCOL 3
  720 PRINT scaley*i/10
  730 NEXT
  740 GCOL 2
  750 MOVE 500,-80:PRINT xlabel$
  760 MOVE -100,500:PRINT ylabel$
  770 MOVE 500,910:PRINT title$
  780 VDU 4
  790 ENDPROC
  800 :
  810 DEF PROCplot
  820 GCOL 1
  830 FOR i=1 TO points
  840 CIRCLE data(i,1)*1100/scalex,data(
i,2)*(900)/scaley,10
  850 NEXT
  860 ENDPROC
  870 :
  880 DEF PROCchoice
  890 PRINT" Select Expression for curve
 to be fitted "'
  900 FOR i=1 TO eqns
  910 PRINT;i;") ";eqn$(i);TAB(42-LENnam
e$(i));name$(i)
  920 NEXT
  930 PRINT'"0) Other function of X in t
erms of a and b"
  940 PRINT''Select: ";
  950 REPEAT
  960 key$=GET$
  970 UNTIL key$>="0" AND key$<="6"
  980 eqn=VALkey$
  990 x$=x$(eqn)
 1000 y$=y$(eqn)
 1010 IF eqn=5 THEN
 1020 NSB=(data(1,2)+data(2,2))/2
 1030 data(1,2)=NSB
 1040 data(2,2)=NSB
 1050 start=3
 1060 Bo=(data(3,2)+data(4,2))/2
 1070 data(3,2)=Bo
 1080 data(4,2)=Bo
 1090 FOR i=1 TO 4
 1100 data(i,1)=1.1
 1110 NEXT
 1120 FOR i=1 TO points
 1130 data(i,1)=LOG(data(i,1))
 1140 NEXT
 1150 ELSE
 1160 start=1
 1170 ENDIF
 1180 IF eqn=0 THEN
 1190 PRINT''Enter function of x"
 1200 INPUT"  y="y$
 1210 ENDIF
 1220 CLS
 1230 ENDPROC
 1240 :
 1250 DEF FNnextline
 1260 LOCAL line$
 1270 REPEAT
 1280 line$=GET$#in
 1290 UNTIL line$<>"" AND LEFT$(line$,1)
<>";"
 1300 =line$
 1310 ENDPROC
 1320 :
 1330 DEF PROCloadfile
 1340 CLS
 1350 REPEAT
 1360 INPUT "Name of data file (or *comm
and) : "file$
 1370 IF LEFT$(file$,1)="*" THEN
 1380 OSCLI(file$)
 1390 ENDIF
 1400 UNTIL LEFT$(file$,1)<>"*"
 1410 in=OPENIN(file$)
 1420 title$=FNnextline
 1430 xlabel$=FNnextline
 1440 ylabel$=FNnextline
 1450 points=0
 1460 REPEAT
 1470 points=points+1
 1480 xy$=FNnextline
 1490 data(points,1)=VALxy$
 1500 data(points,2)=VALMID$(xy$,INSTR(x
y$,",")+1)
 1510 UNTIL EOF#in
 1520 CLOSE #in
 1530 CLS
 1540 ENDPROC
 1550 :
 1560 DEF PROCguess(eqn)
 1570 CASE eqn OF
 1580 WHEN 1:
 1590 a=1.2*FNmax(1)
 1600 b=0.2*FNmax(2)
 1610 WHEN 2
 1620 a=1.2*FNmax(1)
 1630 b=0.2*FNmax(2)
 1640 WHEN 3:
 1650 b=(FNmax(2)-FNmin(2))/(FNmax(1)-FN
min(1))
 1660 a=b*FNmin(2)-FNmin(1)
 1670 WHEN 4:
 1680 a=1.2*FNmax(1)
 1690 b=0.5
 1700 WHEN 5:
 1710 a=3
 1720 b=(FNmax(1)+FNmin(1))/2
 1730 WHEN 6:
 1740 a=-0.5
 1750 b=1.5*FNmax(1)
 1760 WHEN 0:
 1770 REPEAT
 1780 INPUT"Estimate of a="a
 1790 UNTIL a<>0
 1800 REPEAT
 1810 INPUT"Estimate of b="b
 1820 UNTIL b<>0
 1830 CLS
 1840 ENDCASE
 1850 ENDPROC
 1860 :
 1870 DEF FNssy(a,b)
 1880 LOCAL i,x,ycalc
 1890 sumsq=0
 1900 FOR i=start TO points
 1910 x=data(i,1)
 1920 ycalc=EVAL(y$) : REM uses a and b!
 1930 diffsq=(data(i,2)-ycalc)^2
 1940 sumsq=sumsq+diffsq
 1950 NEXT
 1960 =sumsq
 1970 :
 1980 DEF FNmax(Z)
 1990 LOCAL i
 2000 max=data(1,Z)
 2010 FOR i=1 TO points
 2020 IF data(i,Z)>max max=data(i,Z)
 2030 NEXT i
 2040 =max
 2050 :
 2060 DEF FNmin(Z)
 2070 LOCAL i,
 2080 min=data(1,Z)
 2090 FOR i=1 TO points
 2100 IF data(i,Z)<min min=data(i,Z)
 2110 NEXT i
 2120 =min
 2130 :
 2140 DEF PROCoptimise
 2150 IF maxsq=0 newsq=0:oldsq=0:best=0:
ENDPROC
 2160 optloop=1
 2170 iters=0
 2180 REPEAT
 2190 PROCiterate(TRUE,a,b,oldsq)
 2200 best=newsq
 2210 PROCmonitor(newsq)
 2220 PROCiterate(FALSE,a,b,newsq)
 2230 PROCmonitor(newsq)
 2240 optloop+=1
 2250 UNTIL optloop>100 OR best<1E-5 OR
newsq/best<1+1E5 AND newsq/best>1-1E-5
 2260 ENDPROC
 2270 :
 2280 DEF PROCiterate(z,RETURN ca,RETURN
 cb,oldsq)
 2290 IF maxsq=0 newsq=0:oldsq=0:best=0:
ENDPROC
 2300 factor=1
 2310 newsq=FNssy(ca,cb)
 2320 IF newsq>=oldsq THEN factor=-10
 2330 REPEAT
 2340 iters+=1
 2350 PRINTTAB(0,5)"Iterations";FNform(i
ters)
 2360 IF z THEN
 2370 ca=ca+a/factor
 2380 ELSE
 2390 cb=cb+b/factor
 2400 ENDIF
 2410 newsq=FNssy(ca,cb)
 2420 IF newsq>=oldsq factor=-10*factor
 2430 oldsq=newsq
 2440 UNTIL factor>=10000
 2450 ENDPROC
 2460 :
 2470 DEF PROCmonitor(newsq)
 2480 IF maxsq<>0 THEN
 2490 PRINTTAB(0,5)"Iterations";FNform(i
ters)
 2500 PRINT"Time taken";FNform(TIME DIV
100)
 2510 PRINT"SSy'/SSy";FNform(newsq/best)
 2520 PRINT"Best";FNform(best)
 2530 ENDIF
 2540 ENDPROC
 2550 :
 2560 DEF PROCdraw(a,b,scalex,scaley)
 2570 LOCAL x,y
 2580 IF eqn=5 THEN
 2590 x=FNmin(1):y=EVAL(y$)
 2600 ELSE
 2610 x=0:y=0
 2620 ENDIF
 2630 GCOL 6
 2640 MOVE x*1100/scalex,y*900/scaley
 2650 FOR i=1 TO 100
 2660 x=x+scalex/100
 2670 y=EVAL(y$)
 2680 DRAW x*1100/scalex,y*900/scaley
 2690 NEXT
 2700 GCOL 5
 2710 CASE eqn OF
 2720 WHEN 1
 2730 LINE 0,a*900/scaley,1100,a*900/sca
ley
 2740 LINE b*1100/scalex,0,b*1100/scalex
,a*900/scaley
 2750 WHEN 6
 2760 LINE 0,-3*a*900/scaley,-b*825/(a*s
calex),0
 2770 LINE -530*b/(scalex*a),0,-530*b/(s
calex*a),-a*900/scaley
 2780 ENDCASE
 2790 ENDPROC
 2800 :
 2810 DEF PROCoutput
 2820 PRINTTAB(0,10)"Coefficient a";FNfo
rm(a)
 2830 PRINT"Coefficient b";FNform(b)
 2840 PRINT"Min. squares";FNform(newsq)
 2850 PRINT"Data points";FNform(points)
 2860 PRINT"R.M.S.";FNform(SQR(newsq)/(p
oints-2))
 2870 CASE eqn OF
 2880 WHEN 1:
 2890 PRINT"Vmax";FNform(a);" ";ylabel$
 2900 PRINT"Km";FNform(b);" ";xlabel$
 2910 WHEN 2:
 2920 PRINT"Bind. sites";FNform(a);" ";y
label$
 2930 PRINT"Kd";FNform(b);" ";xlabel$
 2940 WHEN 3:
 2950 PRINT"Intercept";FNform(a)
 2960 PRINT"Slope";FNform(b)
 2970 WHEN 5:
 2980 PRINT"NSB";FNform(NSB)
 2990 PRINT"Bo";FNform(Bo)
 3000 c=1.1
 3010 FOR I=20 TO 80 STEP30
 3020 c=c-0.3
 3030 y=(Bo-NSB)*c+NSB
 3040 x=INT(EVAL(x$))
 3050 PRINT"ED";INT(I);FNform(INT(x));"
";xlabel$
 3060 NEXT
 3070 ENDCASE
 3080 ENDPROC
 3090 :
 3100 DEF PROCstats
 3110 DIM datasq(100,2)
 3120 ssy=0:ssx=0:sumx=0:sumy=0
```

```
 3130 datasq()=data()*data()
 3140 FOR I=start TO points
 3150 ssy=ssy+datasq(I,2)
 3160 ssx=ssx+datasq(I,1)
 3170 sumx=sumx+data(I,1)
 3180 sumy=sumy+data(I,2)
 3190 sumxy=sumxy+(data(I,1)*data(I,2))
 3200 NEXT
 3210 ssy=ssy-sumy^2/(points-start+1)
 3220 ssx=ssx-sumx^2/(points-start+1)
 3230 df%=points-start
 3240 residualssy=best
 3250 regressionssy=ssy-best
 3260 residualdf%=df%-1
 3270 regressiondf%=df%-residualdf%
 3280 regression_meansq=regressionssy/re
gressiondf%
 3290 residual_meansq=residualssy/residu
aldf%
 3300 IF maxsq=0 F=99999 ELSE F=regressi
on_meansq/residual_meansq
 3310 IF maxsq=0 THEN r=1 ELSE r=(sumxy-
sumx*sumy/points)/SQR(ssx*ssy)
 3320 IF F<1 THEN F=1/F
 3330 PRINTTAB(0,20);"ANALYSIS OF VARIAN
CE"'
 3340 PRINT"Regress. sum sqr";FNform(reg
ressionssy)
 3350 PRINT"Residual sum sqr";FNform(res
idualssy)
 3360 PRINT"Total sum of sqrs";FNform(ss
y)
 3370 PRINT"Regress. mean sqr";FNform(re
gression_meansq)
 3380 PRINT"Residual mean sqr";FNform(re
sidual_meansq)
 3390 PRINT"Regress. d.f";FNform(regress
iondf%)
 3400 PRINT"Residual d.f";FNform(residua
ldf%)
 3410 PRINT"Total d.f";FNform(df%)
 3420 IF eqn=3 PRINT"Correlation coeff";
FNform(r)
 3430 ENDPROC
 3440 :
 3450 DEF FNform(n)
 3460 n$=STR$n
 3470 d=INSTR(n$,".")
 3480 IF d<>0 THEN
 3490 n$=LEFT$(n$+"0000",d+4)
 3500 ELSE
 3510 d=LENn$+1
 3520 ENDIF
 3530 PRINTTAB(30-d);
 3540 =n$
 3550 :
 3560 DEF PROCreadequations
 3570 READ eqns
 3580 DIM name$(eqns),eqn$(eqns),x$(eqns
),y$(eqns)
 3590 FOR eqn=1 TO eqns
 3600 READ name$(eqn),eqn$(eqn)
 3610 READ x$(eqn),y$(eqn)
 3620 NEXT
 3630 ENDPROC
 3640 :
 3650 DATA 6
 3660 DATA Michaelis-Menten,y=ax/(b+x)
 3670 DATA "",a*x/(b+x)
 3680 :
 3690 DATA Antibody binding,y=abx/(1+bx)
 3700 DATA "",a*b*x/(1+b*x)
 3710 :
 3720 DATA Linear plot,y=a+bx
 3730 DATA "",a+b*x
 3740 :
 3750 DATA Exponential,y=a(1-e^(-bx))
 3760 DATA "",a*(1-EXP(-b*x))
 3770 :
 3780 DATA Logistic,y=(Bo-NSB)/(1+(log x
/a)^b)+NSB
 3790 DATA 10^(10^((LOG((a^b)*((Bo-y)/(y
-NSB))))/b)),(Bo-NSB)/(1+(x/a)^b)+NSB
 3800 :
 3810 DATA Scatchard,y=a+b/x
 3820 DATA "",a+b/x
```

Listing 2

```
   10 REM >Bezier8 - M/C Bezier Curves (
Info2)
   20 REM By David Breakwell
   30 REM For Eight bit machines
   40 REM (C) BAU Apr 1992
   50 :
   60 MODE 1
   70 VDU 12,23;8202;0;0;0;0;
   80 DIM coord% 40,mem% 850,int% 5
   90 oswrch=&FFEE
  100 coordinate=&70
  110 storage=&72
  120 stack=&74
  130 PROCassemble
  140 REPEAT
  150 FOR loop%=0 TO 3
  160 !(coord%+loop%*8)=RND(1280)
  170 !(coord%+loop%*8+4)=RND(1024)
  180 NEXT
  190 X%=coord%
  200 Y%=coord%DIV256
  210 A%=5
  220 GCOL 0,RND(3)
  230 CALL bezier
  240 IF RND(100)>90 THEN CLS
  250 UNTIL FALSE
  260 END
  270 :
  280 DEF PROCassemble
  290 FOR pass=0 TO 2 STEP 2:P%=mem%
  300 [OPT pass
  310 .bezier
  320 STX coordinate
  330 STY coordinate+1
  340 STA num
  350 TSX:STX stack
  360 LDA num
  370 PHA
  380 LDY #0
  390 .push_loop1
  400 LDA (coordinate),Y
  410 PHA
  420 INY
  430 LDA (coordinate),Y
  440 PHA
  450 INY:INY:INY
  460 CPY #32
  470 BNE push_loop1
  480 .divloop
  490 JSR sub_divide
  500 TSX:CPX stack
  510 BNE divloop
  520 RTS
  530 :
  540 .sub_divide
  550 PLA:STA storage
  560 PLA:STA storage+1
  570 LDY #47
  580 .pull_loop1
  590 PLA
  600 STA ablock,Y
  610 DEY
  620 CPY #31
  630 BNE pull_loop1
  640 PLA
  650 CMP #0
  660 BNE skip
  670 JMP draw_bez
  680 .skip
  690 STA num
  700 LDA #0
  710 OPT FNaddandshift(36,40,48)
  720 OPT FNcopy( 0,32)
  730 OPT FNaddandshift(32,36, 4)
  740 OPT FNaddandshift( 4,48, 8)
  750 OPT FNcopy(28,44)
  760 OPT FNaddandshift(40,44,24)
  770 OPT FNaddandshift(48,24,20)
  780 OPT FNaddandshift( 8,20,12)
  790 OPT FNcopy(16,12)
  800 OPT FNaddandshift(38,42,50)
  810 OPT FNcopy( 2,34)
  820 OPT FNaddandshift(34,38, 6)
  830 OPT FNaddandshift( 6,50,10)
  840 OPT FNcopy(30,46)
  850 OPT FNaddandshift(42,46,26)
  860 OPT FNaddandshift(50,26,22)
  870 OPT FNaddandshift(10,22,14)
  880 OPT FNcopy(18,14)
  890 LDA num
  900 SEC:SBC #1
  910 STA num
  920 PHA
  930 OPT FNcopytostack(0,16)
  940 LDA num:PHA
  950 OPT FNcopytostack(16,32)
  960 LDA storage+1:PHA
  970 LDA storage:PHA
  980 RTS
  990 :
 1000 .draw_bez
 1010 LDX #32
 1020 LDA #25:JSR oswrch
 1030 LDA # 4 :JSR oswrch
 1040 LDA ablock,X:JSR oswrch:INX
 1050 LDA ablock,X:JSR oswrch:INX
 1060 LDA ablock,X:JSR oswrch:INX
 1070 LDA ablock,X:JSR oswrch:INX
 1080 .drawloop
 1090 LDA #25:JSR oswrch
 1100 LDA # 5:JSR oswrch
 1110 LDA ablock,X:JSR oswrch:INX
 1120 LDA ablock,X:JSR oswrch:INX
 1130 LDA ablock,X:JSR oswrch:INX
 1140 LDA ablock,X:JSR oswrch:INX
 1150 CPX #48
 1160 BNE drawloop
 1170 LDA storage+1:PHA
 1180 LDA storage:PHA
 1190 RTS
 1200 :
 1210 .num EQUB 4
 1220 .plot EQUB 0
 1230 .ablock
 1240 ]:NEXT
 1250 ENDPROC
 1260 :
 1270 DEF FNaddandshift(f%,s%,a%)
 1280 [OPT pass
 1290 LDX #f%
 1300 LDA ablock,X
 1310 LDX #s%
 1320 CLC
 1330 ADC ablock,X
 1340 LDX #a%
 1350 STA ablock,X
 1360 LDX #f%+1
 1370 LDA ablock,X
 1380 LDX #s%+1
 1390 ADC ablock,X
 1400 LDX #a%+1
 1410 STA ablock,X
 1420 CLC
 1430 LSR ablock,X
 1440 DEX
 1450 ROR ablock,X
 1460 ]
 1470 =pass
 1480 :
 1490 DEF FNcopy(a%,s%)
 1500 [OPT pass
 1510 LDX #s%
 1520 LDA ablock,X
 1530 LDX #a%
 1540 STA ablock,X
 1550 LDX #s%+1
 1560 LDA ablock,X
 1570 LDX #a%+1
 1580 STA ablock,X
 1590 ]
 1600 =pass
 1610 :
 1620 DEF FNcopytostack(s%,f%)
 1630 LOCAL copyloop
 1640 [OPT pass
 1650 LDX #s%
 1660 .copyloop
 1670 LDA ablock,X
 1680 PHA
 1690 INX
 1700 CPX #f%
 1710 BNE copyloop
 1720 ]
 1730 =pass
```

Listing 3

```
   10 REM >BezDemo (Info3)
   20 REM By Dave Lawrence
   30 REM For all machines
   40 REM (C) BAU Apr 1992
   50 :
   60 MODE 1
   70 DIM x(4),y(4)
   80 GCOL 0,3
   90 FOR i=1 TO 4
  100 READ x(i),y(i)
  110 MOVE x(i)-7,y(i)-7:PLOT 1,14,14
  120 MOVE x(i)-7,y(i)+7:PLOT 1,14,-14
  130 NEXT
  140 MOVE x(1),y(1):DRAW x(2),y(2)
  150 MOVE x(4),y(4):DRAW x(3),y(3)
  160 GCOL 0,1:COLOUR 1
  170 PRINT"Parametric...";
  180 PROCparametric(x(1),y(1),x(2),y(2)
,x(3),y(3),x(4),y(4))
  190 VDU 7:IFGET
  200 GCOL 0,2:COLOUR 2
  210 PRINTCHR$13;"Recursive..."
  220 PROCrecursive(x(1),y(1),x(2),y(2),
x(3),y(3),x(4),y(4))
  230 END
  240 :
  250 DATA 100,100
  260 DATA 150,600
  270 DATA 1200,40
  280 DATA 500,900
  290 :
  300 DEF PROCrecursive(x1,y1,x2,y2,x3,y
3,x4,y4)
  310 LOCAL x12,y12,x23,y23,x34,y34,x123
,y123,x234,y234,x1234,y1234
  320 IF SQR((x4-x1)^2+(y4-y1)^2)<16 MOV
E x1,y1:DRAW x4,y4:ENDPROC
  330 x12=(x1+x2)/2
  340 y12=(y1+y2)/2
  350 x23=(x2+x3)/2
  360 y23=(y2+y3)/2
  370 x34=(x3+x4)/2
  380 y34=(y3+y4)/2
  390 x123=(x12+x23)/2
  400 y123=(y12+y23)/2
  410 x234=(x23+x34)/2
  420 y234=(y23+y34)/2
  430 x1234=(x123+x234)/2
  440 y1234=(y123+y234)/2
  450 PROCrecursive(x1,y1,x12,y12,x123,y
123,x1234,y1234)
  460 PROCrecursive(x1234,y1234,x234,y23
4,x34,y34,x4,y4)
  470 ENDPROC
  480 :
  490 DEF PROCparametric(x1,y1,x2,y2,x3,
y3,x4,y4)
  500 MOVE x1,y1
  510 FOR t=0 TO 1 STEP 0.01
  520 x=FNpoint(x1,x2,x3,x4,t)
  530 y=FNpoint(y1,y2,y3,y4,t)
  540 DRAW x,y
  550 NEXT
  560 ENDPROC
  570 :
  580 DEF FNpoint(z1,z2,z3,z4,t)
  590 = (1-t)*(1-t)*(1-t)*z1 + 3*(1-t)*(
1-t)*t*z2 + 3*(1-t)*t*t*z3 + t*t*t*z4
```

Listing 4

```
   10 REM >Toner27 (Info4)
   20 REM By Jan Vibe
   30 REM For RISC OS Machines
   40 REM (C) BAU Apr 92
   50 :
   60 MODE 15:OFF
   70 PROCshowall
   80 PROCwait("")
   90 PROCtiles
  100 PROCwait("tiles")
  110 PROCtree
  120 PROCwait("tree")
  130 PROCflower
  140 END
  150 :
  160 DEF PROCcol(c,i)
  170 LOCAL r,g,b
  180 b=c DIV 9:c=c MOD 9
  190 g=c DIV 3:c=c MOD 3
  200 r=c
  210 c=r+4*g+16*b
  220 IF i>=4 c=c+&15
  230 GCOL c TINT (64*i) MOD 256
  240 ENDPROC
  250 :
  260 DEF PROCwait(file$)
  270 VDU 7
  280 REPEAT:MOUSE x,y,z:k$=INKEY$(0):UN
TIL z<>0 OR k$<>""
  290 IF (k$="S" OR k$="s") AND file$<>"
" THEN OSCLI"ScreenSave pic_"+file$
  300 CLS
  310 ENDPROC
  320 :
  330 DEF PROCshowall
  340 VDU 5
  350 FOR col=0 TO 26
  360 FOR int=0 TO 7
  370 MOVE 80,40*int+380
  380 GCOL 63 TINT 255
  390 PRINT STR$int
  400 PROCcol(col,int)
  410 RECTANGLE FILL 100+40*col,40*int+3
52,34,32
  420 NEXT
  430 GCOL 63 TINT 255
  440 x=104+40*col-8*(col<10)
  450 MOVE x,344:PRINTSTR$col
  460 NEXT
  470 VDU 4:OFF
  480 PRINTTAB(28,5)"27 colours in 8 sha
des."
  490 VDU 30
  500 ENDPROC
  510 :
  520 DEF PROCtiles
  530 DIM x(17,14),y(17,14)
  540 FOR x=0 TO 17
  550 FOR y=0 TO 14
  560 x(x,y)=80*x-40+RND(60)-30
  570 y(x,y)=80*y-40+RND(60)-30
  580 NEXT
  590 NEXT
  600 FOR y=0 TO 13
  610 FOR x=0 TO 16
  620 xc=(x(x,y)+x(x+1,y)+x(x,y+1)+x(x+1
,y+1))/4
  630 yc=(y(x,y)+y(x+1,y)+y(x,y+1)+y(x+1
,y+1))/4
  640 col=RND(26)
  650 FOR int=0 TO 7
  660 PROCcol(col,int)
  670 x1=(xc*int+x(x,  y)  *(7-int))/7
  680 y1=(yc*int+y(x,  y)  *(7-int))/7
  690 x2=(xc*int+x(x+1,y)  *(7-int))/7
  700 y2=(yc*int+y(x+1,y)  *(7-int))/7
  710 x3=(xc*int+x(x+1,y+1)*(7-int))/7
  720 y3=(yc*int+y(x+1,y+1)*(7-int))/7
  730 x4=(xc*int+x(x,  y+1)*(7-int))/7
  740 y4=(yc*int+y(x,  y+1)*(7-int))/7
  750 MOVE x1,y1:MOVE x2,y2:PLOT 85,x4,y
4:PLOT 85,x3,y3
  760 NEXT
  770 NEXT
  780 NEXT
  790 ENDPROC
  800 :
  810 DEF PROCtree
  820 PROCcol(16,0):RECTANGLE FILL 0,0,1
280,300
  830 PROCcol(21,7):RECTANGLE FILL 0,300
,1280,724
  840 FOR i=500 TO 200 STEP -1
  850 x=RND(i/4)+8
  860 y=RND(x/2)+4
  870 PROCcol(26,RND(4)+3)
  880 ELLIPSE FILL RND(1280),RND(400)+50
0,x,y
  890 NEXT
  900 PROCbranch(640,0,256,0,48)
  910 ENDPROC
  920 :
  930 DEF PROCbranch(x,y,len,ang,width)
  940 LOCAL xx,yy,int,l,col,Z
  950 d=len
  960 IF d<16 THEN d=d*1.5
  970 xx=x+d*SINRADang
  980 yy=y+d*COSRADang
  990 PROCtwig(x,y,xx,yy,width)
 1000 IF len>=16 THEN
 1010 PROCbranch(xx,yy,len/(1.2+RND(1)*.
3),ang-30-RND(20),width/1.4)
 1020 PROCbranch(xx,yy,len/(1.2+RND(1)*.
3),ang+30+RND(20),width/1.4)
 1030 ELSE
 1040 col=RND(27)-1
 1050 Z=1+RND(1)/2
 1060 FOR int=7 TO 0 STEP -1
 1070 PROCcol(col,7-int)
 1080 CIRCLE FILL xx,yy,Z*int
 1090 NEXT
 1100 ENDIF
 1110 ENDPROC
 1120 :
 1130 DEF PROCtwig(x1,y1,x2,y2,width)
 1140 LOCAL dist,i,int,col,x,y,size
 1150 IF width<=2 THEN
 1160 LINE x1,y1,x2,y2
 1170 ELSE
 1180 dist=SQR((x2-x1)^2+(y2-y1)^2)
 1190 dx=(x2-x1)/dist
 1200 dy=(y2-y1)/dist
 1210 col=RND(27)-1
 1220 FOR int=0 TO 7
 1230 PROCcol(col,int)
 1240 size=width-(int+1)*width/8
 1250 IF size<=2 THEN
 1260 LINE x1,y1,x2,y2
 1270 ELSE
 1280 FOR i=0 TO dist STEP size/4+2
 1290 x=(i*x2+(dist-i)*x1)/dist
 1300 y=(i*y2+(dist-i)*y1)/dist
 1310 CIRCLE FILL x,y,size
 1320 NEXT
 1330 ENDIF
 1340 NEXT
 1350 ENDIF
 1360 ENDPROC
 1370 :
 1380 DEF PROCflower
 1390 ORIGIN 640,512
 1400 x=0
 1410 y=0
 1420 ang=RND(360)
 1430 speed=RND(3)+7
 1440 xadd=speed*SINRADang
 1450 yadd=speed*COSRADang
 1460 col=RND(27)-1
 1470 int=0
 1480 rot=0
 1490 rad=0
 1500 REPEAT
 1510 PROCcol(col,7-ABS(7-int))
 1520 int=(int+1)MOD15
 1530 IF int=0 col=RND(27)-1
 1540 x1=x+xadd
 1550 y1=y+yadd
 1560 IF x1*x1+y1*y1>480*480 THEN
 1570 ang=INT(DEGASN(x/480)+.5)
 1580 IF y<0 ang=180-ang
 1590 IF x<0 AND y>0 ang=360+ang
 1600 ang=(ang+135+RND(90))MOD360
 1610 speed=RND(3)+7
 1620 xadd=speed*SINRADang:yadd=speed*CO
SRADang
 1630 ENDIF
 1640 x+=xadd
 1650 y+=yadd
 1660 rot=(rot+1)MOD360
 1670 rad=(rad+8)MOD360
 1680 r=(2+SINRADrad)*8
 1690 FOR a=rot TO 360+rot STEP 30
 1700 sin=SINRADa
 1710 cos=COSRADa
 1720 x1=x*sin+y*cos
 1730 y1=y*sin-x*cos
 1740 CIRCLE FILL x1,y1,r
 1750 CIRCLE FILL y1,x1,r
 1760 NEXT
```

```
1770 IF INKEY$(0)=" " PROCwait("flower")
1780 UNTIL 0
```

Listing 5

```
10 REM >Point32 (Info5)
20 REM Screen poking demo
30 REM by Dave Acton
40 REM for 32-bit machines only
50 REM (c) BAU Apr 92
60 :
70 MODE 13
80 DIM code% &100
90 :
100 link=14:pc=15
110 FOR pass%=0 TO 2 STEP 2
120 P%=code%
130 [OPT pass%
140 .vdu    EQUD    148
150 EQUD    -1
160 .plot   LDR     r3,vdu              ; addr=base
170 ADD     r3,r3,r1,LSL #8  ; addr=addr+y*256
180 ADD     r3,r3,r1,LSL #6  ; addr=addr+y*64
190 STRB    r2,[r3,r0]       ; addr=addr+x, and store
200 MOV     pc,link          ; return
210 ]
220 NEXT pass%
230 :
240 SYS "OS_ReadVduVariables",vdu,vdu
250 FOR A%=0 TO 255
260 B%=255-A%
270 PRINTTAB(0,0)A%;",";B%;" "
280 C%=RND(256)-1
290 CALL plot
300 wait=GET
310 NEXT
320 END
```

Listing 6

```
10 REM >Cube (Info6)
20 REM Picture cube
30 REM by Dave Acton
40 REM for 32-bit machines
50 REM (c) BAU Apr 92
60 :
70 MODE 15
80 MODE 13
90 OFF
100 DIM code% &800
110 f%=10
120 k%=1<<f%
130 DIM x(3),y(3),z(3)
140 angs%=64
150 DIM xsd% 16*angs%,ysd% 16*angs%
160 DIM xt% 16*angs%,yt% 16*angs%
170 width%=640
180 height%=256
190 PROCass
200 pics!0=FNloadsprite("pic_tree","screendump")
210 pics!4=FNloadsprite("pic_flower","screendump")
220 pics!8=FNloadsprite("pic_tiles","screendump")
230 s=350
240 FOR ang%=0 TO angs%-1
250 PRINTTAB(0,0)ang%
260 x(0)=160*FNc(ang%)
270 x(1)=160*FNc(ang%+angs%/4)
280 x(2)=x(1)
290 x(3)=x(0)
300 y()=200,200,400,400
310 z(0)=160*FNs(ang%)
320 z(1)=160*FNs(ang%+angs%/4)
330 z(2)=z(1)
340 z(3)=z(0)
350 FOR i%=0 TO 3
360 xsd%!(16*ang%+4*i%)=INT(160+x(i%)/(z(i%)+800)*s)*k%
370 ysd%!(16*ang%+4*i%)=INT(128-s/2.5+y(i%)/(z(i%)+800)*s)*k%
380 NEXT
390 FOR i%=0 TO 3
400 x(i%)=160*FNc(ang%-i%*angs%/4)
410 z(i%)=160*FNs(ang%-i%*angs%/4)
420 NEXT
430 y()=200
440 FOR i%=0 TO 3
450 xt%!(16*ang%+4*i%)=INT(160+x(i%)/(z(i%)+800)*s)*k%
460 yt%!(16*ang%+4*i%)=INT(128-s/2.5+y(i%)/(z(i%)+800)*s)*k%
470 NEXT
480 NEXT
490 ang%=0
500 bank%=1
510 xb%!0 =0
520 yb%!0 =0
530 xb%!4 =(width%-1)<<f%
540 yb%!4 =0
550 xb%!8 =(width%-1)<<f%
560 yb%!8 =(height%-1)<<f%
570 xb%!12=0
580 yb%!12=(height%-1)<<f%
590 COLOUR 176
600 *FX 112,1
610 CLS
620 *FX 112,2
630 CLS
640 VDU 28,10,25,29,7
650 CALL anim
660 END
670 :
680 DEF FNc(a)=COSRAD(a*360/angs%)
690 DEF FNs(a)=SINRAD(a*360/angs%)
700 :
710 DEF PROCass
720 sp=13:link=14:pc=15
730 FOR pass%=0 TO 2 STEP 2
740 P%=code%
750 [OPT pass%
760 .vdup   EQUD    148
770 EQUD    -1
780 .vdu    EQUD    0
790 .sdat   EQUD    0
800 .xb%    EQUS    STRING$(16,CHR$0)
810 .yb%    EQUS    STRING$(16,CHR$0)
820 .rx1%   EQUD    0
830 .rdx1%  EQUD    0
840 .ry1%   EQUD    0
850 .rdy1%  EQUD    0
860 .rx2%   EQUD    0
870 .rdx2%  EQUD    0
880 .ry2%   EQUD    0
890 .rdy2%  EQUD    0
900 :
910 .plot   STMFD   (sp)!,{r0-r12,link}
920 ADR     r0,vdup
930 ADR     r1,vdu
940 SWI     "OS_ReadVduVariables"
950 :
960 MOV     r6,#0
970 ADR     r2,ya%
980 LDR     r12,[r2,r6,LSR #28]
990 MOV     r1,#3<<30
1000 .findlow
1010 LDR    r0,[r2,r1,LSR #28]
1020 CMP    r0,r12
1030 MOVLT  r12,r0
1040 MOVLT  r6,r1
1050 SUBS   r1,r1,#1<<30
1060 BNE    findlow
1070 MOV    r7,r6
1080 BL     calc_grad_a
1090 BL     calc_grad_b
1100 :
1110 .plotloop
1120 .check1
1130 ADR    r14,ya%
1140 SUB    r0,r6,#1<<30
1150 LDR    r0,[r14,r0,LSR #28]
1160 CMP    r0,r12
1170 BGT    plotb
1180 SUB    r6,r6,#1<<30
1190 CMP    r6,r7
1200 BEQ    done
1210 BL     calc_grad_a
1220 B      check1
1230 .plotb
1240 .check2
1250 ADR    r14,ya%
1260 ADD    r0,r7,#1<<30
1270 LDR    r0,[r14,r0,LSR #28]
1280 CMP    r0,r12
1290 BGT    plotc
1300 ADD    r7,r7,#1<<30
1310 CMP    r6,r7
1320 BEQ    done
1330 BL     calc_grad_b
1340 B      check2
1350 .plotc
1360 BL     line
1370 :
1380 ADR    r0,rx1%
1390 LDMIA  r0,{r1-r4}
1400 ADD    r1,r1,r2
1410 ADD    r3,r3,r4
1420 STMIA  r0!,{r1-r4}
1430 LDMIA  r0,{r1-r4}
1440 ADD    r1,r1,r2
1450 ADD    r3,r3,r4
1460 STMIA  r0!,{r1-r4}
1470 :
1480 ADD    r10,r10,r8
1490 ADD    r11,r11,r9
1500 ADD    r12,r12,#1<<f%
1510 B      plotloop
1520 .done  LDMFD   (sp)!,{r0-r12,pc}
1530 :
1540 .calc_grad_a
1550 STMFD  (sp)!,{link}
1560 MOV    r4,r6
1570 SUB    r5,r6,#1<<30
1580 ADR    r3,rx1%
1590 BL     calc_grad
1600 MOV    r8,r2
1610 MOV    r10,r3
1620 LDMFD  (sp)!,{pc}
1630 :
1640 .calc_grad_b
1650 STMFD  (sp)!,{link}
1660 MOV    r4,r7
1670 ADD    r5,r7,#1<<30
1680 ADR    r3,rx2%
1690 BL     calc_grad
1700 MOV    r9,r2
1710 MOV    r11,r3
1720 LDMFD  (sp)!,{pc}
1730 :
1740 .calc_grad
1750 STMFD  (sp)!,{r6,r7,link}
1760 ADR    r14,ya%
1770 LDR    r1,[r14,r5,LSR #28]
1780 LDR    r2,[r14,r4,LSR #28]
1790 SUB    r6,r1,r2
1800 :
1810 ADR    r14,xb%
1820 LDR    r0,[r14,r5,LSR #28]
1830 LDR    r7,[r14,r4,LSR #28]
1840 SUB    r0,r0,r7
1850 MOV    r0,r0,LSL #f%
1860 MOV    r1,r6
1870 BL     div
1880 MOV    r0,r7
1890 STMIA  r3!,{r0,r2}
1900 :
1910 ADR    r14,yb%
1920 LDR    r0,[r14,r5,LSR #28]
1930 LDR    r7,[r14,r4,LSR #28]
1940 SUB    r0,r0,r7
1950 MOV    r0,r0,LSL #f%
1960 MOV    r1,r6
1970 BL     div
1980 MOV    r0,r7
1990 STMIA  r3!,{r0,r2}
2000 :
2010 ADR    r14,xa%
2020 LDR    r3,[r14,r4,LSR #28]
2030 LDR    r0,[r14,r5,LSR #28]
2040 SUB    r0,r0,r3
2050 MOV    r0,r0,LSL #f%
2060 MOV    r1,r6
2070 BL     div
2080 LDMFD  (sp)!,{r6,r7,pc}
2090 :
2100 .xa%   EQUS    STRING$(16,CHR$0)
2110 .ya%   EQUS    STRING$(16,CHR$0)
2120 :
2130 .line  STMFD   (sp)!,{r6-r10,link}
2140 SUB    r7,r11,r10
2150 MOVS   r7,r7,ASR #f%
2160 LDMLEFD (sp)!,{r6-r10,pc}
2170 :
2180 ADR    r14,rx1%
2190 LDMIA  r14,{r0-r6}
2200 MOV    r8,r0
2210 MOV    r9,r2
2220 SUB    r0,r4,r8
2230 MOV    r1,r7
2240 BL     div
2250 MOV    r4,r2
2260 SUB    r0,r6,r9
2270 ;MOV    r1,r7 \ .div will leave intact if positive
2280 BL     div
2290 MOV    r5,r2
2300 :
2310 MOV    r6,r12,LSR #f%
2320 LDR    r3,vdu
2330 ADD    r3,r3,r6,LSL #8
2340 ADD    r3,r3,r6,LSL #6
2350 ADD    r3,r3,r10,ASR #f%
2360 LDR    r10,sdat
2370 SUBS   r7,r7,#12
2380 BMI    line8
2390 .align32
2400 TST    r3,#3
2410 BEQ    line32
2420 FNbyte(1)
2430 STRB   r1,[r3],#1
2440 SUB    r7,r7,#1
2450 B      align32
2460 .line32
2470 FNword(1)
2480 FNword(2)
2490 STMIA  r3!,{r1,r2}
2500 SUBS   r7,r7,#8
2510 BPL    line32
2520 .line8
2530 FNbyte(1)
2540 STRB   r1,[r3],#1
2550 SUB    r7,r7,#1
2560 CMN    r7,#12
2570 BGE    line8
2580 LDMFD  (sp)!,{r6-r10,pc}
2590 :
2600 .div
2610 STMFD  (sp)!,{r4,link}
2620 EOR    r14,r0,r1
2630 CMP    r0,#0
2640 RSBMI  r0,r0,#0
2650 CMP    r1,#0
2660 MOVEQ  r2,#0
2670 LDMEQFD (sp)!,{r4,pc}
2680 RSBMI  r1,r1,#0
2690 MOV    r4,r1
2700 CMP    r4,r0,LSR #1
2710 .div1  MOVLS   r4,r4,LSL #1
2720 CMPLS  r4,r0,LSR #1
2730 BLS    div1
2740 MOV    r2,#0
2750 .div2  CMP     r0,r4
2760 SUBCS  r0,r0,r4
2770 ADC    r2,r2,r2
2780 MOV    r4,r4,LSR #1
2790 CMP    r4,r1
2800 BCS    div2
2810 TST    r14,#1<<31
2820 RSBNE  r2,r2,#0
2830 LDMFD  (sp)!,{r4,pc}
2840 :
2850 .anim  STMFD   (sp)!,{r0-r12,link}
2860 MOV    r5,#0   ; angle
2870 .anlp  MOV     r0,#19
2880 SWI    "XOS_Byte"
2890 MOV    r0,#112
2900 LDR    r1,bank
2910 SWI    "XOS_Byte"
2920 LDR    r1,bank
2930 RSB    r1,r1,#3
2940 STR    r1,bank
2950 MOV    r0,#113
2960 SWI    "XOS_Byte"
2970 SWI    &100+12
2980 MOV    r6,#3
2990 .anlp2 ADD     r7,r5,r6,LSL #FNlog2(angs%/4)
3000 AND    r7,r7,#angs%-1
3010 LDR    r4,xsda
3020 ADD    r4,r4,r7,LSL #4
3030 LDMIA  r4,{r0-r3}
3040 ADR    r4,xa%
3050 STMIA  r4,{r0-r3}
3060 LDR    r4,ysda
3070 ADD    r4,r4,r7,LSL #4
3080 LDMIA  r4,{r0-r3}
3090 ADR    r4,ya%
3100 STMIA  r4,{r0-r3}
3110 TST    r6,#1
3120 LDREQ  r0,pics
3130 LDRNE  r0,pics+4
3140 STR    r0,sdat
3150 BL     plot
3160 SUBS   r6,r6,#1
3170 BPL    anlp2
3180 LDR    r4,xta
3190 ADD    r4,r4,r5,LSL #4
3200 LDMIA  r4,{r0-r3}
3210 ADR    r4,xa%
3220 STMIA  r4,{r0-r3}
3230 LDR    r4,yta
3240 ADD    r4,r4,r5,LSL #4
3250 LDMIA  r4,{r0-r3}
3260 ADR    r4,ya%
3270 STMIA  r4,{r0-r3}
3280 LDR    r0,pics+8
3290 STR    r0,sdat
3300 BL     plot
3310 ADD    r5,r5,#1
3320 CMP    r5,#angs%
3330 MOVEQ  r5,#0
3340 SWI    "XOS_ReadEscapeState"
3350 BCC    anlp
3360 LDMFD  (sp)!,{r0-r12,pc}
3370 :
3380 .pics  EQUS    STRING$(12,CHR$0)
3390 .bank  EQUD    1
3400 .xsda  EQUD    xsd%
3410 .ysda  EQUD    ysd%
3420 .xta   EQUD    xt%
3430 .yta   EQUD    yt%
3440 ]
3450 NEXT
3460 ENDPROC
3470 :
3480 DEF FNword(reg)
3490 [OPT pass%
3500 FNbyte(reg)
3510 FNbyte(14)
3520 ORR    reg,reg,r14,LSL #8
3530 FNbyte(14)
3540 ORR    reg,reg,r14,LSL #16
3550 FNbyte(14)
3560 ORR    reg,reg,r14,LSL #24
3570 ]
3580 =0
3590 :
3600 DEF FNbyte(reg)
3610 IF NOT FNpower(width%) THEN
3620 [OPT pass%
3630 MOV    reg,r9,ASR #f%
3640 MOV    r0,#width%
3650 MLA    reg,r0,reg,r10
3660 ]
3670 ELSE
3680 [OPT pass%
3690 MOV    reg,r9,ASR #f%
3700 ADD    reg,r10,reg,LSL #FNlog2(width%)
3710 ]
3720 ENDIF
3730 [OPT pass%
3740 LDRB   reg,[reg,r8,ASR #f%]
3750 ADD    r8,r8,r4
3760 ADD    r9,r9,r5
3770 ]
3780 =0
3790 :
3800 DEF FNpower(n%)
3810 =(1<<(FNlog2(n%)))=n%
3820 :
3830 DEF FNlog2(n%)
3840 LOCAL l%
3850 l%=-1
3860 WHILE n%>0
3870 l%+=1
3880 n%=n%>>1
3890 ENDWHILE
3900 =l%
3910 :
3920 DEF FNloadsprite(f$,sp$)
3930 SYS "OS_File",5,f$ TO exists%,,,,slen%
3940 IF exists%<>1 ERROR 17,"Can't find """+f$+""""
3950 DIM s% slen%+4
3960 !s%=slen%+4
3970 SYS "OS_File",255,f$,s%+4
3980 SYS "OS_SpriteOp",40+256,s%,sp$ TO ,,,w%,h%
3990 IF w%<>width% OR h%<>height% ERROR 17,sp$+" of """+f$+""" had bad dimensions"
4000 SYS "OS_SpriteOp",24+256,s%,sp$ TO ,,sa%
4010 =sa%+sa%!32
```

Listing 7

```
10 REM >Hypno32 By Richard Boakes (Info7) (C) BAU Apr 92
20 MODE12:ORIGIN640,512:OFF:VDU19,0,24,255,255,255:FORr=819TO1STEP-1:GCOL0,(r/2)MOD32:CIRCLEFILL0,0,r:NEXT:REPEATFORw=15TO0STEP-1:VDU19,w,7;0;19,w+7MOD15,0;0;:WAIT:NEXT:UNTILINKEY-99
```

Listing 8

```
10 REM>Hypno8 for Eight-bit machines (Info8) (C) BAU Apr 92
20 MODE2:VDU23;8202;0;0;0;29,640;512;:FORx%=0TO640STEP8:FORy%=0TO512STEP4:GCOL0,SQR(x%*x%/8+y%*y%/8)MOD16:PLOT69,x%,y%:PLOT69,x%,-y%:PLOT69,-x%,y%:PLOT69,-x%,-y%:NEXT,:A%=19:REPEATFORw%=15TO0STEP-1:VDU19,w%,7;0;19,(w%+7)MOD16;0;0:CALL&FFF4:NEXT:UNTIL0
```

Listing 9

```
10 REM >!RunImage (Info9)
20 REM By Ron Wardenier
30 REM For RISC OS machines
40 REM (C) BAU Apr 92
50 :
60 ON ERROR PROCerror
70 :
80 REM default CMOS RAM locations to be used (change these if conflicts
90 REM arise with applications that use the same locations):
100 DATA 44,45
110 :
120 buffsize%=25
130 DIM result% buffsize%
140 DIM format% buffsize%
150 DIM code% 400
160 $format%="%W3,%DY %M3 %CE%YR.%24:%MI"+CHR$(0)
170 spos%=19
180 RESTORE 100
190 READ location1,location2
200 :
210 PROCopenlog
220 IF chlog%=0 THEN
230 PROCcreatelog
240 PROCopenref
250 IF chref%=0 THEN
260 PROCcreateref
270 ELSE
280 PROCreadref
290 ENDIF
300 PROCassemble
310 ELSE
320 PROCopenref
330 IF chref%=0 THEN
340 PROCcreateref
350 PROCassemble
360 PROCupdatelog("Unknown"+CHR$(10))
```

```
  370 ELSE
  380 PROCreadref
  390 PROCassemble
  400 CALL calculatedowntime
  410 PROCconvertdateandtime
  420 PROCupdatelog($result%+CHR$(10))
  430 ENDIF
  440 ENDIF
  450 :
  460 tref%=USR(maketref)
  470 PROCupdateref
  480 PROCcloseref
  490 C%=tref%+!wkmin
  500 CALL calculatetime
  510 PROCconvertdateandtime
  520 PROCupdatelog($result%+"-")
  530 PROCcloselog
  540 PROCmakemodule
  550 PROCsetvar
  560 END
  570 :
  580 DEF PROCsetvar
  590 OSCLI("Set UpTime$ "+$result%)
  600 ENDPROC
  610 :
  620 DEF PROCconvertdateandtime
  630 SYS "OS_ConvertDateAndTime",time,r
esult%,buffsize%,format% TO ,zeroptr%
  640 ?zeroptr%=13
  650 ENDPROC
  660 :
  670 DEF PROCupdatelog(string$)
  680 PTR#chlog%=EXT#chlog%
  690 IF PTR#chlog%<>0 THEN
  700 PTR#chlog%=PTR#chlog%-1
  710 ENDIF
  720 BPUT#chlog%,string$
  730 ENDPROC
  740 :
  750 DEF PROCcreatelog
  760 OSCLI("Create <UpTime$Dir>.UpTimeL
og 0")
  770 OSCLI("SetType <UpTime$Dir>.UpTime
Log Text")
  780 chlog%=OPENOUT("<UpTime$Dir>.UpTim
eLog")
  790 ENDPROC
  800 :
  810 DEF PROCopenlog
  820 chlog%=OPENUP("<UpTime$Dir>.UpTime
Log")
  830 ENDPROC
  840 :
  850 DEF PROCcloselog
  860 CLOSE#chlog%
  870 ENDPROC
  880 :
  890 DEF PROCreadref
  900 PTR#chref%=spos%
  910 tref%=EVAL("&"+GET$#chref%)
  920 ENDPROC
  930 :
  940 DEF PROCupdateref
  950 PTR#chref%=spos%
  960 SYS "OS_ConvertHex8",tref%,result%
,buffsize% TO ,zeroptr%
  970 ?zeroptr%=13
  980 BPUT#chref%,$result%
  990 ENDPROC
 1000 :
 1010 DEF PROCcreateref
 1020 OSCLI("Create <UpTime$Dir>.UpTimeR
ef 0")
 1030 OSCLI("SetType <UpTime$Dir>.UpTime
Ref Data")
 1040 chref%=OPENOUT("<UpTime$Dir>.UpTim
eRef")
 1050 A$="Current reference"
 1060 BPUT#chref%,A$+STRING$(spos%-LEN(A
$)-1," ")+"&00000000"
 1070 tref%=0
 1080 ENDPROC
 1090 :
 1100 DEF PROCopenref
 1110 chref%=OPENUP("<UpTime$Dir>.UpTime
Ref")
 1120 ENDPROC
 1130 :
 1140 DEF PROCcloseref
 1150 CLOSE#chref%
 1160 ENDPROC
 1170 :
 1180 DEF PROCassemble
 1190 FOR pass%=0 TO 2 STEP 2
 1200 P%=code%
 1210 :
 1220 [OPT pass%
 1230 FNequ_macro
 1240 :
 1250 .calculatedowntime
 1260 MOV      R0,#161
 1270 MOV      R1,#location1
 1280 SWI      "OS_Byte":strb R2,dt
 1290 MOV      R1,#location2
 1300 SWI      "OS_Byte":strb R2,dt+1
 1310 LDR      R2,dt
 1320 LDR      R1,tref
 1330 ADD      R2,R2,R1
 1340 .calculatetime
 1350 LDR      R1,minute
 1360 MUL      R0,R2,R1
 1370 MOV      R1,#0
 1380 LDR      R2,offset
 1390 LDR      R3,offset+4
 1400 ADDS     R0,R0,R2
 1410 ADCS     R1,R1,R3
 1420 STR      R0,time
 1430 STR      R1,time+4
 1440 MOV      R15,R14
 1450 :
 1460 .maketref
 1470 FNtime_macro
 1480 LDR      R1,wkmin
 1490 SUB      R0,R0,R1
 1500 STR      R0,tref
 1510 MOV      R15,R14
 1520 ]
 1530 NEXT pass%
 1540 ENDPROC
 1550 :
 1560 DEF PROCmakemodule
 1570 Null$=CHR$(0)
 1580 Tab$=CHR$(9)
 1590 Version$="1.00"
 1600 Date$=MID$(TIME$,5,11)
 1610 Title$="UpTimeLogger"+Null$
 1620 Help$="UpTime Logger"+Tab$+Version
$+" ("+Date$+")"+Null$
 1630 FOR pass%=4 TO 6 STEP 2
 1640 P%=0
 1650 O%=code%
 1660 PROCassemblemodule
 1670 NEXT pass%
 1680 SYS "OS_Module",11,code%,O%-code%
 1690 ENDPROC
 1700 :
 1710 DEF PROCassemblemodule
 1720 [OPT pass%
 1730 EQUD     0
 1740 EQUD     initialise
 1750 EQUD     finalise
 1760 EQUD     service
 1770 EQUD     title_string
 1780 EQUD     help_string
 1790 EQUD     0
 1800 .title_string
 1810 EQUS     Title$
 1820 ALIGN
 1830 .help_string
 1840 EQUS     Help$
 1850 ALIGN
 1860 .interval
 1870 EQUD     6000
 1880 FNequ_macro
 1890 :
 1900 .initialise
 1910 STMFD    R13!,{R0-R2,R14}
 1920 BL       update
 1930 LDR      R0,interval
 1940 ADR      R1,int_entry
 1950 MOV      R2,#0
 1960 SWI      "OS_CallEvery"
 1970 LDMFD    R13!,{R0-R2,PC}^
 1980 :
 1990 .finalise
 2000 STMFD    R13!,{R0,R1,R14}
 2010 ADR      R0,int_entry
 2020 MOV      R1,#0
 2030 SWI      "OS_RemoveTickerEvent"
 2040 LDMFD    R13!,{R0,R1,PC}^
 2050 :
 2060 .service
 2070 STMFD    R13!,{R14}
 2080 CMP      R1,#&27
 2090 BNE      service_exit
 2100 BL       initialise
 2110 .service_exit
 2120 LDMFD    R13!,{PC}
 2130 :
 2140 .int_entry
 2150 STMFD    R13!,{R14}
 2160 BL       update
 2170 LDMFD    R13!,{PC}
 2180 .update
 2190 STMFD    R13!,{R0-R4,R8,R9,R14}
 2200 MOV      R9,PC
 2210 ORR      R8,R9,#3
 2220 TEQP     R8,#0
 2230 MOVNV    R0,R0
 2240 STMFD    R13!,{R14}
 2250 FNtime_macro
 2260 LDR      R2,tref
 2270 SUBS     R0,R0,R2
 2280 STR      R0,dt
 2290 MOV      R0,#162
 2300 MOV      R1,#location1
 2310 LDRB     R2,dt
 2320 SWI      "OS_Byte"
 2330 MOV      R1,#location2
 2340 LDRB     R2,dt+1
 2350 SWI      "OS_Byte"
 2360 LDMFD    R13!,{R14}
 2370 TEQP     R9,#0
 2380 MOVNV    R0,R0
 2390 LDMFD    R13!,{R0-R4,R8,R9,PC}^
 2400 ]
 2410 ENDPROC
 2420
 2430 DEF FNequ_macro
 2440 [OPT pass%
 2450 .offset
 2460 EQUD     &DC870E00
 2470 EQUD     &00000042
 2480 .wkmin
 2490 EQUD     10080
 2500 .minute
 2510 EQUD     6000
 2520 .halfminute
 2530 EQUD     3000
 2540 .time
 2550 EQUD     0
 2560 EQUD     0
 2570 .dt
 2580 EQUD     0
 2590 .tref
 2600 EQUD     tref%
 2610 ]
 2620 =0
 2630 :
 2640 DEF FNtime_macro
 2650 [OPT pass%
 2660 MOV      R0,#14
 2670 MOV      R1,#3
 2680 STRB     R1,time
 2690 ADR      R1,time
 2700 SWI      "OS_Word"
 2710 LDR      R0,time
 2720 LDR      R1,time+4
 2730 LDR      R2,offset
 2740 LDR      R3,offset+4
 2750 SUBS     R0,R0,R2
 2760 SBCS     R1,R1,R3
 2770 LDR      R1,minute
 2780 MOV      R2,#0
 2790 MOV      R3,#0
 2800 MOV      R4,#1<<31
 2810 :
 2820 .divloop
 2830 MOVS     R0,R0,ASL#1
 2840 ADC      R2,R2,R2
 2850 CMP      R2,R1
 2860 SUBGE    R2,R2,R1
 2870 ORRGE    R3,R3,R4
 2880 MOVS     R4,R4,lsr#1
 2890 BNE      divloop
 2900 :
 2910 LDR      R1,halfminute
 2920 CMP      R2,R1
 2930 ADDGE    R3,R3,#1
 2940 MOV      R0,R3
 2950 ]
 2960 =0
 2970 :
 2980 DEF PROCerror
 2990 OSCLI("Close")
 3000 MODE 0
 3010 REPORT
 3020 PRINT " at line ";ERL;
 3030 PRINT " in UpTime"
 3040 END
 3050 ENDPROC
```

Listing 10

```
   10 REM >Mortgage (Info10)
   20 REM By John West
   30 REM For all machines
   40 REM (C) BAU Apr 92
   50 :
   60 MODE 7
   70 PROCinit
   80 REPEAT
   90 PROCdisplay
  100 PROCinput
  110 PROCcalc
  120 PROCresult
  130 PROCrepeat
  140 UNTIL FALSE
  150 :
  160 DEF PROCinit
  170 dbl$=CHR$141:m$="MORTGAGE":fl$=CHR
$136
  180 re$=CHR$129:gr$=CHR$130
  190 ye$=CHR$131:wh$=CHR$135
  200 VDU 23,1,0;0;0;0;
  210 ENDPROC
  220 :
  230 DEF PROCdisplay
  240 CLS
  250 FOR I%=2 TO 3:PRINTTAB(8,I%)ye$dbl
$FNline(4)SPC1m$SPC1FNline(4):NEXT
  260 PRINT''"Calculates monthly mortgage
 repayments"'"for various rates and peri
ods:-"'
  270 PRINTTAB(0,6)"For a given rate of"
re$"I"wh$"%/year repaid"
  280 PRINTTAB(0,7)"over"re$"Y"wh$"years
, calculates repayments"
  290 PRINTTAB(0,8)"for"re$"I"wh$","re$"
I+0.5"wh$","re$"I+1.0"wh$"and"re$"I+1.5"
wh$"%/year"
  300 PRINT TAB(0,9)"over"re$"Y"wh$","re
$"Y+5"wh$"and"re$"Y+10"wh$"years."''
  310 ENDPROC
  320 :
  330 DEF PROCinput
  340 INPUT"Enter amount of loan (£)  ..
."p%
  350 INPUT'"Enter lowest rate (% p.a.)
 ..."n
  360 INPUT'"Enter shortest time (years)
 ..."Y%
  370 ENDPROC
  380 :
  390 DEF PROCcalc
  400 DIM M$(3,2),T$(3,2)
  410 FOR i%=0 TO 3
  420 FOR j%=0 TO 2
  430 R=(n+i%/2)/100
  440 A=p%*R
  450 B=(1+R)^(Y%+5*j%)
  460 M=A*B/(12*(B-1))
  470 T=M*12*(Y%+5*j%)
  480 M$(i%,j%)=FNpence(FNround(M))
  490 T$(i%,j%)=FNpence(FNround(T))
  500 NEXT
  510 NEXT
  520 ENDPROC
  530 :
  540 DEF PROCresult
  550 CLS
  560 PRINTTAB(0,0)ye$"Mortgage Int.  Re
pay Monthly    Total"
  570 PRINTTAB(0,1)ye$"  loan   rate  ti
me  payment    paid"
  580 PRINTTAB(4,2)"£      %/yr  years
 £          £"
  590 PRINTTAB(0,3)ye$FNline(39)TAB(1,4)
gr$;p%
  600 FOR i%=0 TO 3
  610 FOR j%=0 TO 2
  620 y%=(j%+1)+4*(i%+1)
  630 H%=LENSTR$(n+i%)
  640 K%=LENSTR$(Y%+5*j%)
  650 IF j%=0 PRINTTAB(13-H%,y%);n+i%/2
  660 PRINTTAB(19-K%,y%);Y%+5*j%
  670 L%=LENM$(i%,j%)
  680 M%=LENT$(i%,j%)
  690 PRINTTAB(29-L%,y%)M$(i%,j%)
  700 PRINTTAB(40-M%,y%)T$(i%,j%)
  710 NEXT
  720 NEXT
  730 PRINTTAB(0,21)ye$FNline(39)
  740 ENDPROC
  750 :
  760 DEF FNpence(X)
  770 X$=STR$X:L%=LENX$
  780 dot=INSTR(X$,".")
  790 IF dot=L%-2 THEN =X$
  800 IF dot=L%-1 THEN =X$+"0"
  810 IF dot=0    THEN =X$+".00"
  820 REPEAT
  830 L%=LENX$
  840 X$=LEFT$(X$,LENX$-1)
  850 UNTIL INSTR(X$,".")=L%-3
  860 =X$
  870 :
  880 DEF FNround(X)=.01*INT(100*X+.5)
  890 :
  900 DEF FNline(X%)=STRING$(X%,"_")
  910 :
  920 DEF PROCrepeat
  930 PRINTTAB(5,23)re$fl$"Press SPACE b
ar for repeat"
  940 REPEAT UNTIL GET=32
  950 ENDPROC
```

Listing 11

```
   10 REM >Mastermind (Info11)
   20 REM Thinking by Malcolm Gray
   30 REM Original display by J A McHugh
   40 REM for all machines
   50 REM (c) BAU Apr 92
   60 :
   70 MODE 7
   80 PROCc(0)
   90 PROCinit
  100 go=0
  110 REPEAT
  120 PROCscreen
  130 guess=0
  140 IF go=1 PROCcomp ELSE PROChuman
  150 IF black%=4 THEN score%(go)=score%
(go)+11-guess
  160 IF go=0 AND black%=4 PROCinfo("Wel
l done - you got it!")
  170 IF go=0 AND black%<4 PROCinfo("Sor
ry - it was "+sol$)
  180 IF go=1 AND black%=4 PROCinfo("I g
ot it!")
  190 IF go=1 AND black%<4 PROCinfo("Oop
s, I didn't get it")
  200 wait=INKEY(1500)
  210 go=1-go
  220 IF go=0 PROCinfo("SCORES: you="+ST
R$(score%(0))+", me="+STR$(score%(1))):w
ait=INKEY(1500)
  230 UNTIL FALSE
  240 END
  250 :
  260 DEF PROCinfo(i$)
  270 i$=STRING$(15-LEN(i$)/2," ")+i$
  280 i$=i$+STRING$(30-LEN(i$)," ")
  290 PROCtwice(5,20,CHR$135+i$)
  300 ENDPROC
  310 :
  320 DEF PROChuman
  330 FOR i=0 TO 3
  340 col%(i)=RND(7)-1
  350 NEXT
  360 PROCmakestrings
  370 REPEAT
  380 PROCenter(guess,"Your guess")
  390 PROCmark(guess)
  400 guess=guess+1
  410 UNTIL guess=8 OR black%=4
  420 ENDPROC
  430 :
  440 DEF PROCcomp
  450 PROCenter(0,"Enter code")
  460 FOR i=0 TO 3
  470 col%(i)=in%(i)
  480 NEXT
  490 PROCmakestrings
  500 PROCtwice(5,20,CHR$135+"Thinking
 ( "+sol$+")")
  510 history%=0
  520 PROCpt1
  530 PROCconvg
  540 IF black%<4 PROCpt2
  550 ENDPROC
  560 :
  570 DEF PROCinit
  580 DIM col%(3),in%(4),mark%(3,2),scor
e%(1)
  590 DIM c%(209,6)
  600 DIM g%(6)
  610 DIM hb%(15)
  620 DIM hc%(15,3)
  630 DIM ans%(3)
  640 cols$="RGYBMCW"
  650 sel$=""
  660 FOR i=1 TO 7
  670 sel$=sel$+CHR$(128+i)+MID$(cols$,i
,1)
  680 NEXT
  690 ENDPROC
  700 :
  710 DEF PROCmakestrings
  720 sol$=""
  730 FOR i=0 TO 3
  740 sol$=sol$+CHR$(145+col%(i))+CHR$17
5+CHR$175
  750 NEXT
  760 sol$=sol$+CHR$156+CHR$135
  770 ENDPROC
  780 :
  790 DEF PROCc(s)
  800 VDU 23;10,255-159*s;0;0;0;
  810 ENDPROC
  820 :
  830 DEF PROCscreen
  840 VDU 12,132,157,135
  850 FOR i=1 TO 22
  860 VDU 31,0,i,132,157,32,156,31,37,i,
132,157
  870 NEXT
  880 VDU 31,3,18,132,157,31,0,23,132,15
7
  890 VDU 31,9,0:PRINT"INPUT";SPC13;"REP
LY"
  900 FOR i=1 TO 17:VDU 31,4,i,141:NEXT
  910 FOR i=1 TO 17:VDU 31,19,i,132,157,
156:NEXT
  920 FOR i=20 TO 21:VDU 31,4,i,141:NEXT
  930 ENDPROC
  940 :
  950 DEF PROCtwice(x,y,str$)
  960 PRINTTAB(x,y);str$;TAB(x,y+1);str$
;
  970 ENDPROC
  980 :
  990 DEF PROCenter(guess,g$)
 1000 PROCtwice(5,20,CHR$135+g$+": "+sel
$)
 1010 *FX 21,1
 1020 peg=0
 1030 done=FALSE
 1040 REPEAT
 1050 PROCc(1)
 1060 VDU 31,peg*3+6,2+guess*2
 1070 key=GET
 1080 PROCc(0)
 1090 IF key=127 AND peg<>0 peg=peg-1:PR
OCpeg(peg*3+2,guess,-1)
```

```
1100 IF key=13 AND peg=4 done=TRUE
1110 col=INSTR(cols$,CHR$(key AND &DF))
-1
1120 IF col>=0 AND peg<4 PROCpeg(peg*3+
2,guess,col):in%(peg)=col:peg=peg+1
1130 UNTIL done
1140 ENDPROC
1150 :
1160 DEF PROCshowguess(guess)
1170 FOR peg=0 TO 3
1180 PROCpeg(peg*3+2,guess,in%(peg))
1190 NEXT
1200 ENDPROC
1210 :
1220 DEF PROCmark(guess)
1230 FOR i=0 TO 3
1240 mark%(i,1)=0
1250 mark%(i,2)=0
1260 NEXT
1270 markx=20
1280 white%=0
1290 black%=0
1300 FOR i=0 TO 3
1310 IF in%(i)=col%(i) PROCdo(i,i,3)
1320 NEXT
1330 FOR i=0 TO 3
1340 FOR j=0 TO 3
1350 IF i<>j AND in%(i)=col%(j) PROCdo(
i,j,6)
1360 NEXT
1370 NEXT
1380 ENDPROC
1390 :
1400 DEF PROCdo(peg1,peg2,c)
1410 IF mark%(peg1,1)=1 OR mark%(peg2,2
)=1 ENDPROC
1420 mark%(peg1,1)=1
1430 mark%(peg2,2)=1
1440 PROCpeg(markx,guess,c)
1450 IF c=3 black%=black%+1 ELSE white%
=white%+1
1460 markx=markx+3
1470 ENDPROC
1480 :
1490 DEF PROCpeg(x,y,c)
1500 VDU 31,x+3,y*2+1
1510 IF c=-1 VDU 32,32,32,8,8,8,10,32,3
2,32 ELSE VDU 145+c,124,124,8,8,8,10,145
+c,124,124
1520 ENDPROC
1530 :
1540 DEF PROCpt1
1550 k%=0
1560 FOR a%=0 TO 4
1570 FOR b%=0 TO 4-a%
1580 FOR c%=0 TO 4-b%-a%
1590 FOR d%=0 TO 4-c%-b%-a%
1600 FOR e%=0 TO 4-d%-c%-b%-a%
1610 FOR f%=0 TO 4-e%-d%-c%-b%-a%
1620 g%=4-(a%+b%+c%+d%+e%+f%)
1630 c%(k%,0)=a%
1640 c%(k%,1)=b%
1650 c%(k%,2)=c%
1660 c%(k%,3)=d%
1670 c%(k%,4)=e%
1680 c%(k%,5)=f%
1690 c%(k%,6)=g%
1700 k%=k%+1
1710 NEXT
1720 NEXT
1730 NEXT
1740 NEXT
1750 NEXT
1760 NEXT
1770 FOR x%=0 TO 6
1780 g%(x%)=-(x%<4)
1790 NEXT
1800 max%=k%-1
1810 REPEAT
1820 t%=FNgo
1830 c%=0
1840 FOR y%=0 TO max%
1850 IF FNcmp(y%)=t% THEN PROCcpy(y%,c%
):c%=c%+1
1860 NEXT
1870 max%=c%-1
1880 min%=100
1890 FOR y%=0 TO 6
1900 g%(y%)=c%(0,y%)
1910 NEXT
1920 UNTIL c%<=1 OR guess=8
1930 ENDPROC
1940 :
1950 DEF FNgo
1960 LOCAL x%
1970 PROCconv
1980 PROCgook
1990 hb%(history%)=black%
2000 FOR x%=0 TO 3
2010 hc%(history%,x%)=in%(x%)
2020 NEXT
2030 history%=history%+1
2040 =white%+black%
2050 :
2060 DEF PROCcpy(y%,x%)
2070 LOCAL g%
2080 FOR g%=0 TO 6
2090 c%(x%,g%)=c%(y%,g%)
2100 NEXT
2110 ENDPROC
2120 :
2130 DEF FNcmp(x%)
2140 LOCAL t%,y%
2150 FOR y%=0 TO 6
2160 t%=t%+FNmin(g%(y%),c%(x%,y%))
2170 NEXT
2180 =t%
2190 :
2200 DEF FNmin(a%,b%)
2210 IF a%<b% THEN b%=a%
2220 =b%
2230 :
2240 DEF PROCpt2
2250 PROCmakepermn
2260 PROCcopydown
2270 FOR x%=0 TO 3
2280 g%(x%)=c%(0,x%)
2290 NEXT
2300 REPEAT
2310 t%=FNblk
2320 c%=0
2330 FOR y%=0 TO max%
2340 IF t%=FNbcmp(y%) THEN PROCcp(y%,c%
):c%=c%+1
2350 NEXT
2360 max%=c%-1
2370 FOR y%=0 TO 3
2380 g%(y%)=c%(0,y%)
2390 NEXT
2400 UNTIL c%<=1 OR guess=8
2410 IF black%<>4 THEN t%=FNblk
2420 ENDPROC
2430 :
2440 DEF PROCcopydown
2450 c%=0
2460 FOR y%=0 TO max%
2470 IF FNeq(y%)=FALSE AND FNp2h(y%)=1
THEN PROCcp(y%,c%):c%=c%+1
2480 NEXT
2490 max%=c%-1
2500 ENDPROC
2510 :
2520 DEF PROCmakepermn
2530 a%=0:b%=0:c%=0:d%=0
2540 max%=4*3*2-1
2550 FOR y%=0 TO max%
2560 REPEAT
2570 d%=d%+1
2580 c%=c%-(d%=4):d%=d%+4*(d%=4)
2590 b%=b%-(c%=4):c%=c%+4*(c%=4)
2600 a%=a%-(b%=4):b%=b%+4*(b%=4)
2610 UNTIL ((a%=b%)+(a%=c%)+(a%=d%)+(b%
=c%)+(b%=d%)+(c%=d%))=0
2620 c%(y%,0)=g%(a%)
2630 c%(y%,1)=g%(b%)
2640 c%(y%,2)=g%(c%)
2650 c%(y%,3)=g%(d%)
2660 NEXT
2670 ENDPROC
2680 :
2690 DEF FNeq(y%)
2700 IF y%=max% THEN =0
2710 LOCAL x%,f%
2720 FOR x%=y%+1 TO max%
2730 f%=f% OR FNeq2(x%)
2740 NEXT
2750 =f%
2760 :
2770 DEF FNeq2(x%)
2780 IF c%(y%,0)<>c%(x%,0) THEN =0
2790 IF c%(y%,1)<>c%(x%,1) THEN =0
2800 IF c%(y%,2)<>c%(x%,2) THEN =0
2810 IF c%(y%,3)<>c%(x%,3) THEN =0
2820 =-1
2830 :
2840 DEF PROCcp(x%,y%)
2850 LOCAL t%
2860 FOR t%=0 TO 3
2870 c%(y%,t%)=c%(x%,t%)
2880 NEXT
2890 ENDPROC
2900 :
2910 DEF FNbcmp(y%)
2920 LOCAL x%,t%
2930 FOR x%=0 TO 3
2940 t%=t%-(g%(x%)=c%(y%,x%))
2950 NEXT
2960 =t%
2970 :
2980 DEF FNblk
2990 LOCAL x%
3000 FOR x%=0 TO 3
3010 in%(x%)=g%(x%)
3020 NEXT
3030 PROCgook
3040 =black%
3050 :
3060 DEF PROCconv
3070 k%=0
3080 FOR col%=0 TO 6
3090 FOR loop%=0 TO g%(col%)-1
3100 in%(k%+loop%)=col%
3110 NEXT
3120 k%=k%+g%(col%)
3130 NEXT
3140 IF (history% AND 1) THEN GOTO 3180
3150 FOR loop%=0 TO 1
3160 k%=in%(loop%):in%(loop%)=in%(3-loo
p%):in%(3-loop%)=k%
3170 NEXT
3180 ENDPROC
3190 :
3200 DEF PROCgook
3210 PROCshowguess(guess)
3220 PROCmark(guess)
3230 guess=guess+1
3240 ENDPROC
3250 :
3260 DEF PROCconvg
3270 PROCconv
3280 LOCAL x%
3290 FOR x%=0 TO 3
3300 g%(x%)=in%(x%)
3310 NEXT
3320 ENDPROC
3330 :
3340 DEF FNp2h(y%)
3350 LOCAL x%,f%
3360 f%=1
3370 FOR x%=0 TO history%-1
3380 f%=f% AND (hb%(x%)=FNbl(x%,y%))
3390 NEXT
3400 =f%
3410 :
3420 DEF FNbl(x%,y%)
3430 LOCAL t%,g%
3440 FOR g%=0 TO 3
3450 t%=t%+(c%(y%,g%)=hc%(x%,g%))
3460 NEXT
3470 =-t%
```

Listing 12

```
10 REM >Scribe (Info12)
20 REM By Sam Watkins
30 REM For RISC OS machines
40 REM (C) BAU Apr 92
50 :
60 ON ERROR MODE 0:IF ERR<>17 PRINTRE
PORT$;" at line ";ERL:END ELSE END
70 DIM x1(2),y1(2),x2(2),y2(2),f(2)
80 REPEAT
90 PROCinit
100 PROCcircle1
110 PROCcircle2
120 PROCpen
130 PROCdraw
140 UNTIL FALSE
150 END
160 :
170 DEF PROCinit
180 MODE 15:MODE 12:OFF
190 COLOUR 1,7
200 COLOUR 2,3
210 COLOUR 4,6
220 COLOUR 5,6
230 COLOUR 6,6
240 COLOUR 8,1
250 COLOUR 10,1
260 COLOUR 12,1
270 bank=1
280 *POINTER
290 ORIGIN 640,512
300 GCOL 4,0
310 SYS 6,113,bank
320 SYS 6,112,3-bank
330 ENDPROC
340 :
350 DEF PROCcircle1
360 GCOL 3,1
370 or=1000
380 REPEAT
390 MOUSE x,y,b
400 r1=SQR(x^2+y^2)
410 CIRCLE 0,0,r1
420 PROCswap
430 CIRCLE 0,0,or
440 or=r1
450 UNTIL b
460 CIRCLE 0,0,r1
470 PROCswap
480 PROChangon
490 ENDPROC
500 :
510 DEF PROCcircle2
520 GCOL 3,2
530 ox=0:oy=0::or=1000
540 REPEAT
550 MOUSE xc,yc,b
560 r2=SQR(xc^2+yc^2)-r1
570 CIRCLE xc,yc,r2
580 PROCswap
590 CIRCLE ox,oy,or
600 ox=xc:oy=yc:or=r2
610 UNTIL b
620 CIRCLE xc,yc,r2
630 PROCswap
640 PROChangon
650 ENDPROC
660 :
670 DEF PROCpen
680 GCOL 3,4
690 f=FALSE
700 REPEAT
710 MOUSE xp,yp,b
720 rp=SQR((xp-xc)^2+(yp-yc)^2)
730 LINE xc,yc,xp,yp
740 CIRCLE xp,yp,8
750 PROCswap
760 IF f THEN
770 LINE xc,yc,ox,oy
780 CIRCLE ox,oy,8
790 ENDIF
800 f=TRUE
810 ox=xp:oy=yp
820 UNTIL b
830 GCOL 3,2
840 CIRCLE xc,yc,r2
850 REMLINE xc,yc,xp,yp
860 REMCIRCLE xp,yp,8
870 PROChangon
880 ENDPROC
890 :
900 DEF PROCdraw
910 a=FNangle(xc,yc)
920 a1=FNangle(xp-xc,yp-yc)
930 oxp=xp:oyp=yp
940 oxc=xc:oyc=yc
950 s=1
960 f()=FALSE
970 REPEAT
980 a+=s
990 a1+=r1/r2*s+s
1000 xc=SINRAD(a)*(r1+r2)
1010 yc=COSRAD(a)*(r1+r2)
1020 xp=xc+SINRAD(a1)*rp
1030 yp=yc+COSRAD(a1)*rp
1040 GCOL 3,2:CIRCLE xc,yc,r2
1050 GCOL 3,4:LINE xc,yc,xp,yp:CIRCLE x
p,yp,8
1060 PROCswap
1070 GCOL 3,2:CIRCLE oxc,oyc,r2
1080 GCOL 3,4:LINE oxc,oyc,oxp,oyp:CIRC
LE oxp,oyp,8
1090 GCOL 0,8
1100 IF f(3-bank) THEN
1110 MOVE x1(3-bank),y1(3-bank)
1120 DRAW x2(3-bank),y2(3-bank)
1130 ENDIF
1140 MOVE oxp,oyp:DRAW xp,yp
1150 x1(bank)=oxp:y1(bank)=oyp
1160 x2(bank)=xp:y2(bank)=yp
1170 f(bank)=TRUE
1180 oxc=xc:oyc=yc:oxp=xp:oyp=yp
1190 MOUSE q,q,b
1200 IF b=1 THEN s+=.02
1210 IF b=4 THEN s-=.02
1220 UNTIL b=2
1230 PROChangon
1240 ENDPROC
1250 :
1260 DEF FNangle(x,y)
1270 IF x=0 AND y>=0 THEN =0
1280 IF x=0 AND y<0 THEN =180
1290 atn=DEG(ATN(x/y))
1300 IF x>0 AND y>=0 THEN =atn
1310 IF y<0 THEN =180+atn
1320 IF x<0 AND y>=0 THEN =360+atn
1330 :
1340 DEF PROCswap
1350 WAIT
1360 bank=3-bank
1370 SYS 6,113,bank:SYS 6,112,3-bank
1380 ENDPROC
1390 :
1400 DEF PROChangon
1410 REPEATMOUSExx,yy,bb:UNTIL bb=0
1420 ENDPROC
```

FACE BENDER

Listing 1

```
10 REM MakeDat32 (Face1)
20 REM for Arc only
30 REM (c) BAU Apr 92
40 :
50 file%=OPENOUT "FaceDat"
60 REPEAT
70 READ output$
80 IF output$<>"ENDOFDATA" THEN BPUT
#file%,output$
90 UNTIL output$="ENDOFDATA"
100 CLOSE #file%
110 *SetType FaceDat Text
120 PRINT "FaceDat created."
130 END
140 :
150 DATA "; >FaceDat"
160 DATA
170 DATA "Refs: 648,512 536,500 760,50
0 648,428 648,268 408,412 884,412 648,50
4 648,360 648,528"
180 DATA
190 DATA "Segment: Left eye"
200 DATA "Line: 532,500 536,504 540,50
0 536,496 532,500"
210 DATA "Line: 536,516 512,504 532,48
4 560,504 540,516"
220 DATA "Line: 476,492 532,520 588,49
6"
230 DATA "Line: 484,492 532,480 588,49
6"
240 DATA "Line: 472,508 528,532 592,51
2"
250 DATA "Line: 508,464 540,468 576,48
0"
260 DATA
270 DATA "Segment: Left eyebrow"
280 DATA "Line: 448,532 452,552 500,57
2 556,568 600,556 608,536"
290 DATA "Line: 448,528 496,552 552,54
4 608,536"
300 DATA
310 DATA "Segment: Right eye"
320 DATA "Line: 756,500 760,504 764,50
0 760,496 756,500"
330 DATA "Line: 760,516 736,504 756,48
4 784,504 760,516"
340 DATA "Line: 708,492 760,516 812,49
2"
350 DATA "Line: 708,492 764,480 804,48
8"
360 DATA "Line: 704,512 764,532 816,50
8"
370 DATA "Line: 712,476 748,464 784,46
4"
380 DATA
390 DATA "Segment: Right eyebrow"
400 DATA "Line: 684,536 692,552 744,56
4 796,568 832,552 844,532"
410 DATA "Line: 684,536 748,544 800,55
2 840,532"
420 DATA
430 DATA "Segment: Nose"
440 DATA "Line: 624,520 624,468 624,42
0 616,392 624,364 644,352"
450 DATA "Line: 664,520 664,468 664,41
6 672,392 668,364 644,352"
460 DATA "Line: 600,404 588,388 584,36
8 592,352 612,364 644,352"
470 DATA "Line: 692,404 704,392 708,36
8 696,352 680,364 652,352"
480 DATA
490 DATA "Segment: Left cheekbone"
500 DATA "Line: 580,380 556,352 540,32
0"
510 DATA
520 DATA "Segment: Right cheekbone"
530 DATA "Line: 712,376 740,348 760,31
6"
540 DATA
550 DATA "Segment: Upper lip lines"
560 DATA "Line: 636,336 636,308"
570 DATA "Line: 660,336 660,308"
580 DATA
590 DATA "Segment: Upper lip"
600 DATA "Line: 548,268 596,284 624,29
6 648,284 672,292 708,284 748,272"
610 DATA "Line: 552,268 592,268 624,27
2 652,268 680,272 712,268 744,272"
620 DATA
630 DATA "Segment: Lower lip"
640 DATA "Line: 552,268 592,268 624,27
2 652,268 680,272 712,268 744,272"
650 DATA "Line: 564,264 584,252 620,24
0 652,236 684,240 716,252 740,268"
660 DATA
670 DATA "Segment: Left ear"
680 DATA "Line: 396,480 368,504 352,48
4 360,440 376,384 396,332 420,344"
690 DATA
700 DATA "Segment: Right ear"
710 DATA "Line: 896,484 924,504 936,47
6 928,440 920,388 896,340 876,344"
```

```
720 DATA
730 DATA "Segment: Side of head + oute
r cheekbones"
740 DATA "Line: 412,516 404,440 416,35
6"
750 DATA "Line: 876,520 888,444 872,36
4"
760 DATA "Line: 420,368 436,344 448,32
0"
770 DATA "Line: 872,368 856,348 844,32
4"
780 DATA
790 DATA "Segment: Chin"
800 DATA "Line: 416,356 432,284 460,22
4 516,168 588,120 648,108 720,124 784,16
8 828,220 860,284 876,368"
810 DATA
820 DATA "Segment: Hairline"
830 DATA "Line: 404,504 428,564 456,62
4 480,664 524,700 584,712 640,708 696,70
0 752,696 804,668 840,624 868,576 888,50
8"
840 DATA
850 DATA "Segment: Hair"
860 DATA "Line: 372,264 312,388 304,51
2 328,676 396,800 516,896 632,904 752,90
0 868,824 944,704 984,544 988,408 932,28
0"
870 DATA
880 DATA "Segment: Chin cleft"
890 DATA "Line: 648,152 648,128"
900 DATA
910 DATA "Segment: Chin line"
920 DATA "Line: 612,200 648,208 692,19
6"
930 DATA "ENDOFDATA"
```

Listing 2

```
10 REM >FaceBender (Face2)
20 REM By Jan Vibe
30 REM For RISC OS machines
40 REM (C) BAU Apr 92
50 :
60 ON ERROR CLOSE #0:PRINTREPORT$;" a
t line ";ERL:END
70 MODE 136:MODE 8:OFF
80 COLOUR 0,0,64,128
90 COLOUR 1,160,160,160
100 COLOUR 2,0,0,0
110 VDU 19,0,24,0,64,128
120 steps=10
130 PROCloaddata
140 face1()=face()
150 b=2
160 REPEAT
170 PROCdistort(face2())
180 steps()=face2()-face1()
190 steps()=steps()/steps
200 FOR frame=1 TO steps
210  face1()=face1()+steps()
220  WAIT
230  SYS 6,112,b:SYS 6,113,3-b:CLS
240  b=3-b
250  GCOL 1
260  CIRCLE FILL 640,512,500
270  GCOL 2
280  FOR i=1 TO points
290   PLOT opt(i),face1(i,0),face1(i,1
)
300  NEXT
310 NEXT
320 UNTIL PI=4
330 END
340 :
350 DEF FNnextline
360 REPEAT
370 line$=GET$#in
380 UNTIL line$<>"" AND LEFT$(line$,1)
<>";"
390 =line$
400 :
410 DEF FNcountspaces(head$)
420 PTR#in=0
430 count=0
440 REPEAT
450 a$=GET$#in
460 IF LEFT$(a$,LENhead$)=head$ THEN
470  FOR i=1 TO LENa$
480   IF MID$(a$,i,1)=" " count+=1
490  NEXT
500 ENDIF
510 UNTIL EOF#in
520 =count
530 :
540 DEF PROCgetxy(RETURN x,RETURN y)
550 x=VALline$
560 y=VALMID$(line$,INSTR(line$,",")+1
)
570 PROCgotospace(line$)
580 ENDPROC
590 :
600 DEF PROCgotospace(RETURN a$)
610 a$=MID$(a$,INSTR(a$," ")+1)
620 ENDPROC
630 :
640 DEF FNleft(a$,b$)
650 =(LEFT$(a$,LENb$)=b$)
660 :
670 DEF PROCloaddata
680 in=OPENIN("FaceDat")
690 refs=FNcountspaces("Refs")
700 points=FNcountspaces("Line")
710 DIM refx(refs),refy(refs),drefx(re
fs),drefy(refs)
720 DIM face(points,1),face1(points,1)
,face2(points,1)
730 DIM seg(points),opt(points),steps(
points,1)
740 PTR#in=0
750 line$=FNnextline
760 IF NOT FNleft(line$,"Refs") ERRROR
 1,"Missing reference points"
770 PROCgotospace(line$)
780 FOR i=1 TO refs
790 PROCgetxy(refx(i),refy(i))
800 NEXT
810 segs=0
820 point=0
830 opt()=5
840 GCOL 1:CIRCLE FILL 640,512,500:GCO
L 2
850 WHILE NOT EOF#in
860 line$=FNnextline+" "
870 IF LEFT$(line$,7)="Segment" segs+=
1
880 IF LEFT$(line$,4)="Line" THEN
890 PROCgotospace(line$)
900 opt(point+1)=4
910 REPEAT
920 point+=1
930 PROCgetxy(face(point,0),face(point
,1))
940 PLOT opt(point),face(point,0),face
(point,1)
950 seg(point)=segs
960 UNTIL line$=""
970 ENDIF
980 ENDWHILE
990 CLOSE #in
1000 ENDPROC
1010 :
1020 DEF PROCdistort(RETURN distort())
1030 facewidth  =FNrnd( 0.6,1.0)
1040 faceheight =FNrnd( 0.6,1.0)
1050 round      =FNrnd(-0.5,1.5)
1060 eyedisp    =FNrnd(-30,30)
1070 eyewidth   =FNrnd(0.6,1.2)
1080 eyeheight  =FNrnd(0.6,1.2)
1090 nosewidth  =FNrnd(0.5,1.7)
1100 noseheight =FNrnd(0.6,1.0)
1110 mouthwidth =FNrnd(0.5,1.5)
1120 mouthheight=FNrnd(0.5,1.4)
1130 earwidth   =FNrnd(0.3,1.5)
1140 earheight  =FNrnd(0.3,1.0)
1150 browheight =FNrnd(0.6,1.25)
1160 chinheight =FNrnd(1.0,1.25)
1170 browdisp   =FNrnd(0,60)
1180 c1=(2*round-1)/1024 :c1fw=c1*facew
idth
1190 c2=1.5-round        :c2fw=c2*facew
idth
1200 drefx()=refx()
1210 drefy()=refy()
1220 FOR i=2 TO 10
1230 x=FNxoff(drefx(i),1,c1*drefy(1)+c2
)
1240 drefx(i)=FNxoff(x,1,facewidth)
1250 drefy(i)=FNyoff(drefy(i),1,facewid
th)
1260 NEXT
1270 drefx(2)+=eyedisp
1280 drefx(3)-=eyedisp
1290 FOR point=1 TO points
1300 x=face(point,0)
1310 y=face(point,1)
1320 REM x=FNxoff(x,1,c1*y+c2)
1330 x=FNxoff(x,1,c1fw*y+c2fw)
1340 y=FNyoff(y,1,faceheight)
1350 CASE seg(point) OF
1360 WHEN 1,2 :
1370 x=FNxoff(x+eyedisp,2,eyewidth)
1380 y=FNyoff(y,2,eyeheight)
1390 IF seg(point)=2 y+=browdisp
1400 WHEN 3,4 :
1410 x=FNxoff(x-eyedisp,3,eyewidth)
1420 y=FNyoff(y,3,eyeheight)
1430 IF seg(point)=4 y+=browdisp
1440 WHEN 5,6,7 :
1450 x=FNxoff(x,4,nosewidth)
1460 y=FNyoff(y,4,noseheight)
1470 WHEN 8,9,10 :
1480 x=FNxoff(x,5,mouthwidth)
1490 y=FNyoff(y,5,mouthheight)
1500 WHEN 11 :
1510 x=FNxoff(x,6,earwidth)
1520 y=FNyoff(y,6,earheight)
1530 WHEN 12 :
1540 x=FNxoff(x,7,earwidth)
1550 y=FNyoff(y,7,earheight)
1560 WHEN 13,16 :
1570 REM Nothing
1580 WHEN 15 :
1590 y=FNyoff(y,8,browheight)
1600 WHEN 14,17,18 :
1610 y=FNyoff(y,9,chinheight)
1620 ENDCASE
1630 distort(point,0)=x
1640 distort(point,1)=y
1650 NEXT
1660 ENDPROC
1670 :
1680 DEF FNxoff(var,ref,scale)
1690 =(var-drefx(ref))*scale+drefx(ref)
1700 :
1710 DEF FNyoff(var,ref,scale)
1720 =(var-drefy(ref))*scale+drefy(ref)
1730 :
1740 DEF FNrnd(min,max)
1750 =(max-min)*RND(1)+min
```

Listing 3

```
10 REM >Create face data (Face3)
20 REM for Eight-Bit machines
30 REM (c) BAU Apr 92
40 :
50 file%=OPENOUT"FaceD8"
60 REPEAT
70 READ data$
80 IF data$<>"END" THEN BPUT#file%,EV
AL("&"+data$)
90 UNTIL data$="END"
100 CLOSE #file%
110 PRINT "FaceD8 created"
120 END
130 :
140 DATA 83,67,9F,83,83,47,BE
150 DATA 83,83,83,00,00,00,00
160 DATA 00,00,00,00,00,00,00
170 DATA 00,00,00,00,00,00,00
180 DATA 00,00,00,00,00,00,00
190 DATA 00,00,00,00,00,00,00
200 DATA 00,00,00,00,00,00,00
210 DATA 00,00,00,00,00,00,00
220 DATA 00,00,00,00,00,00,00
230 DATA 00,7F,82,82,94,BC,98
240 DATA 98,81,A5,7B,00,00,00
250 DATA 00,00,00,00,00,00,00
260 DATA 00,00,00,00,00,00,00
270 DATA 00,00,00,00,00,00,00
280 DATA 00,00,00,00,00,00,00
290 DATA 00,00,00,00,00,00,00
300 DATA 00,00,00,00,00,00,00
310 DATA 00,00,00,00,00,00,00
320 DATA 00,00,00,00,00,00,00
330 DATA 00,00,00,00,00,00,00
340 DATA 00,00,00,00,00,00,00
350 DATA 00,00,00,00,00,00,00
360 DATA 00,00,00,00,00,00,00
370 DATA 00,00,00,00,00,00,00
380 DATA 00,00,00,00,00,00,00
390 DATA 00,00,00,00,00,00,00
400 DATA 00,00,00,00,00,00,00
410 DATA 00,00,00,00,00,00,00
420 DATA 00,00,00,00,00,00,00
430 DATA 00,00,00,00,00,00,00
440 DATA 00,00,00,00,00,00,00
450 DATA 00,00,00,00,00,00,00
460 DATA 00,00,00,00,00,00,00
470 DATA 00,00,00,00,00,00,00
480 DATA 00,00,00,00,00,00,00
490 DATA 00,00,00,00,00,00,00
500 DATA 00,00,00,00,01,81,81
510 DATA 81,81,01,81,81,81,81
520 DATA 01,81,81,01,81,81,01
530 DATA 81,81,01,81,81,02,82
540 DATA 82,82,82,82,02,82,82
550 DATA 82,03,83,83,83,83,03
560 DATA 83,83,83,83,03,83,83
570 DATA 03,83,83,03,83,83,03
580 DATA 83,83,04,84,84,84,84
590 DATA 84,04,84,84,84,05,85
600 DATA 85,85,85,85,05,85,85
610 DATA 85,85,85,05,85,85,85
620 DATA 85,85,05,85,85,85,85
630 DATA 85,06,86,86,07,87,87
640 DATA 08,88,08,88,09,89,89
650 DATA 89,89,89,89,09,89,89
660 DATA 89,89,89,89,0A,8A,8A
670 DATA 8A,8A,8A,8A,0A,8A,8A
680 DATA 8A,8A,8A,8A,0B,8B,8B
690 DATA 8B,8B,8B,8B,0C,8C,8C
700 DATA 8C,8C,8C,8C,0D,8D,8D
710 DATA 0D,8D,8D,0D,8D,8D,0D
720 DATA 8D,8D,0E,8E,8E,8E,8E
730 DATA 8E,8E,8E,8E,8E,8E,0F
740 DATA 8F,8F,8F,8F,8F,8F,8F
750 DATA 8F,8F,8F,8F,8F,10,90
760 DATA 90,90,90,90,90,90,90
770 DATA 90,90,90,90,11,91,12
780 DATA 92,92,00,00,00,00,00
790 DATA 00,00,00,00,00,00,00
800 DATA 00,00,00,00,00,00,00
810 DATA 00,00,00,00,00,00,00
820 DATA 00,00,00,00,00,00,00
830 DATA 00,00,00,00,00,00,00
840 DATA 00,00,00,00,00,00,00
850 DATA 00,00,00,00,00,00,00
860 DATA 00,00,00,00,00,00,00
870 DATA 00,66,67,68,67,66,67
880 DATA 61,66,6D,68,58,66,74
890 DATA 5A,66,74,57,65,75,60
900 DATA 68,71,51,52,5E,6C,77
910 DATA 79,51,5D,6B,79,9E,9F
920 DATA A0,9F,9E,9F,99,9E,A5
930 DATA 9F,92,9F,AC,92,A0,AA
940 DATA 91,A0,AD,93,9C,A5,8C
950 DATA 8E,9B,A8,B1,B4,8C,9C
960 DATA A9,B3,7D,7D,7D,7B,7D
970 DATA 82,87,87,87,89,88,82
980 DATA 77,74,73,75,7A,82,8E
990 DATA 91,92,8F,8B,84,72,6C
1000 DATA 68,93,9A,9F,80,80,86
1010 DATA 86,6A,76,7D,83,89,92
1020 DATA 9C,6B,75,7D,84,8B,93
1030 DATA 9B,6B,75,7D,84,8B,93
1040 DATA 9B,6E,73,7C,84,8C,94
1050 DATA 9A,44,3D,39,3B,3F,44
1060 DATA 4A,C1,C8,CB,C9,C7,C1
1070 DATA BC,48,46,49,BC,BF,BB
1080 DATA 4A,4E,51,BB,B7,B4,49
1090 DATA 4D,54,62,74,83,95,A5
1100 DATA B0,B8,BC,46,4C,53,59
1110 DATA 64,73,81,8F,9D,AA,B3
1120 DATA BA,BF,3E,2F,2D,33,44
1130 DATA 62,7F,9D,BA,CD,D7,D8
1140 DATA CA,83,83,7A,83,8E,00
1150 DATA 00,00,00,00,00,00,00
1160 DATA 00,00,00,00,00,00,00
1170 DATA 00,00,00,00,00,00,00
1180 DATA 00,00,00,00,00,00,00
1190 DATA 00,00,00,00,00,00,00
1200 DATA 00,00,00,00,00,00,00
1210 DATA 00,00,00,00,00,00,00
1220 DATA 00,00,00,00,00,00,00
1230 DATA 00,00,00,00,00,82,81
1240 DATA 82,83,82,7E,81,86,81
1250 DATA 7E,84,7D,83,84,87,83
1260 DATA 80,7A,7F,8B,8A,87,7A
1270 DATA 75,70,71,74,79,7B,75
1280 DATA 77,79,82,81,82,83,82
1290 DATA 7E,81,86,81,7E,84,7E
1300 DATA 84,84,87,85,7F,7A,80
1310 DATA 88,8B,8B,79,75,72,71
1320 DATA 75,7A,79,77,75,7A,7D
1330 DATA 8A,96,9D,A4,A7,7D,8A
1340 DATA 97,9D,A4,A7,9A,9E,A3
1350 DATA A7,A4,A7,9A,9D,A3,A7
1360 DATA A4,A7,A0,A7,AF,A1,A8
1370 DATA B0,AB,B2,AB,B2,BC,B8
1380 DATA B5,B8,B6,B8,BB,BC,BC
1390 DATA BB,BC,BB,BC,BB,BC,BC
1400 DATA BB,BC,BB,BC,BB,BD,C0
1410 DATA C3,C4,C3,C0,BC,87,81
1420 DATA 86,91,9F,AC,A9,86,81
1430 DATA 88,91,9E,AA,A9,7E,91
1440 DATA A6,7D,90,A4,A3,A9,AF
1450 DATA A3,A8,AE,A6,B8,C7,D5
1460 DATA E1,E4,E0,D5,C8,B8,A3
1470 DATA 81,72,63,59,50,4D,4E
1480 DATA 50,51,58,63,6F,80,BD
1490 DATA 9E,7F,56,37,1F,1D,1E
1500 DATA 31,4F,77,99,B9,D9,DF
1510 DATA CD,CB,CE,00,00,00,00
1520 DATA 00,00,00,00,00,00,00
1530 DATA 00,00,00,00,00,00,00
1540 DATA 00,00,00,00,00,00,00
1550 DATA 00,00,00,00,00,00,00
1560 DATA 00,00,00,00,00,00,00
1570 DATA 00,00,00,00,00,00,00
1580 DATA 00,00,00,00,00,00,00
1590 DATA 00,00,00,00,00,00,00
1600 DATA 00,00,END
```

Listing 4

```
10 REM >Source8 - for fast 6502 lined
raw (Face4)
20 REM By Dave Lawrence
30 REM For 8 bit machines
40 REM (C) BAU Apr 92
50 :
60 x1=&70
70 y1=&71
80 x2=&72
90 y2=&73
100 dx=&74
110 dy=&75
120 flags=&76
130 c1=&77
140 c2=&79
150 err=&7B
160 addr=&7D
170 point=&7F
180 screen=&80
190 FOR pass=0 TO 2 STEP 2:P%=&900
200 [OPT pass
210 JMP cls
220 .draw
230 STX xs+2
240 STY ys+2
250 STA opts+2
260 LDA #0
270 STA point
280 .drawloop
290 LDA x2
300 STA x1
310 LDA y2
320 STA y1
330 LDY point
340 .xs
350 LDA &FF00,Y
360 STA x2
370 .ys
380 LDA &FF00,Y
390 STA y2
400 .opts
410 LDA &FF00,Y
420 BEQ drawn
430 BPL move
440 JSR line
450 .move
460 INC point
470 BNE drawloop
480 .drawn
490 RTS
500 :
510 .line
520 LDA #0
530 STA flags
540 STA c1+1
550 STA addr
560 LDA x2
570 CMP x1
580 ROR flags
590 SEC
600 SBC x1
610 BCS dxok
620 EOR #&FF
630 ADC #1
640 .dxok
650 STA dx
660 LDA y2
670 CMP y1
680 ROR flags
690 SEC
700 SBC y1
710 BCS dyok
720 EOR #&FF
730 ADC #1
740 .dyok
750 STA dy
760 CMP dx
770 ROR flags
780 BIT flags
790 BPL notswap1
800 LDX dx
810 STA dx
820 STX dy
830 .notswap1
840 LDA dy
850 ASL A
860 ROL c1+1
870 STA c1
880 SEC
890 SBC dx
900 STA err
910 LDA c1+1
920 SBC #0
930 STA err+1
940 LDA err
950 SEC
960 SBC dx
970 STA c2
980 LDA err+1
990 SBC #0
1000 STA c2+1
1010 .lineloop
1020 LDA y1
1030 LSR A
1040 LSR A
1050 LSR A
1060 CLC
1070 ADC screen
1080 STA addr+1
1090 LDA x1
1100 AND #&F8
1110 STA dy
1120 LDA x1
1130 AND #7
1140 TAX
1150 LDA y1
1160 AND #7
1170 ORA dy
1180 TAY
1190 LDA (addr),Y
1200 ORA bits,X
1210 STA (addr),Y
1220 LDA flags
1230 JSR addxy
1240 BIT err+1
1250 BMI errneg
1260 LDX #c2
1270 JSR adderr
1280 LDA flags
1290 EOR #&FF
1300 JSR addxy
```

```
1310 JMP decdx
1320 .errneg
1330 LDX #c1
1340 JSR adderr
1350 .decdx
1360 DEC dx
1370 LDA dx
1380 CMP #255
1390 BNE lineloop
1400 RTS
1410 :
1420 .addxy
1430 BPL dox
1440 LDA flags
1450 AND #&40
1460 BEQ ysub
1470 INC y1
1480 RTS
1490 .ysub
1500 DEC y1
1510 RTS
1520 .dox
1530 LDA flags
1540 AND #&20
1550 BEQ xsub
1560 INC x1
1570 RTS
1580 .xsub
1590 DEC x1
1600 RTS
1610 :
1620 .adderr
1630 LDA err
1640 CLC
1650 ADC &00,X
1660 STA err
1670 LDA err+1
1680 ADC &01,X
1690 STA err+1
1700 RTS
1710 :
1720 .bits
1730 EQUB 128:EQUB 64:EQUB 32:EQUB 16
1740 EQUB 8:EQUB 4:EQUB 2:EQUB 1
1750 :
1760 .cls
1770 LDA screen
1780 CMP #&60
1790 BEQ cls6
1800 LDA #0
1810 TAY
1820 .cls41
1830 ]FOR i=&4000 TO &5F00 STEP &100:[O
PT pass
1840 STA i,Y
1850 ]NEXT:[OPT pass
1860 DEY
1870 BNE cls41
1880 RTS
1890 :
1900 .cls6
1910 LDA #0
1920 TAY
1930 .cls61
1940 ]FOR i=&6000 TO &7F00 STEP &100:[O
PT pass
1950 STA i,Y
1960 ]NEXT:[OPT pass
1970 DEY
1980 BNE cls61
1990 RTS
2000 ]NEXT
2010 OSCLI "Save FaceMC 900 "+STR$~P%
2020 END
```

Listing 5

```
10 REM >Face8 - 8 bit facebender (Fac
e5)
20 REM By Dave Lawrence
30 REM Based on an idea By Jan Vibe
40 REM For 8 bit machines
50 REM (C) BAU April 1992
60 :
70 steps=10
80 IF PAGE>&1100 THEN PRINT"Page must
 be &1100":END
90 ON ERROR MODE 4:REPORT:PRINT" at l
ine ";ERL:END
100 MODE 4
110 VDU 23;10,32;0;0;0;
120 VDU 23;1,32;0;0;0;
130 datax=&4000-256*2*steps:datay=data
x+256
140 fx=datax-256*2:fy=fx+256:opts=fx-2
56
150 rx=opts-256:ry=rx+64
160 dx=rx+128:dy=ry+128
170 HIMEM=rx
180 lastx=datax+(steps-1)*256*2:lasty=
lastx+256
190 OSCLI "Load FaceD8 "+STR$~rx
200 OSCLI "Load FaceMC 900"
210 cls=&900:draw=&903
220 refs=0
230 REPEAT
240 refs=refs+1
250 UNTIL rx?refs=0
260 points=256
270 REPEAT
280 points=points-1
290 UNTIL opts?points<>0
300 points=points+1
310 ?dx=?rx:?dy=?ry
320 disp=2
330 PROCwrite(disp):PROCdisp(disp)
340 PROCdraw(fx,fy)
350 FOR i=0 TO 255-4 STEP 4
360 datax!i=fx!i
370 datay!i=fy!i
380 NEXT
390 REPEAT
400 PROCdistort
410 SOUND 1,-10,100,1
420 FOR i=0 TO 9
430 PROCwrite(3-disp)
440 PROCdraw(datax+i*512,datay+i*512)
450 PROCdisp(3-disp)
460 disp=3-disp
470 NEXT
480 SOUND 1,-10,200,1
490 FOR i=0 TO 255-4 STEP 4
500 datax!i=lastx!i
510 datay!i=lasty!i
520 NEXT
530 UNTIL0
540 END
550 :
560 DEF PROCwrite(b)
570 ?&80=&20+&20*b
580 ENDPROC
590 :
600 DEF PROCdisp(b)
610 s=&2000+&2000*b
620 VDU 23;12,(s DIV 8) DIV 256;0;
630 VDU 23;13,(s DIV 8) MOD 256;0;
640 ENDPROC
650 :
660 DEF PROCdraw(xs,ys)
670 CALL cls
680 A%=opts DIV 256:X%=xs DIV 256:Y%=y
s DIV 256:CALL draw
690 ENDPROC
700 :
710 DEF FNrnd(min,max)
720 =(max-min)*RND(1)+min
730 :
740 DEF PROCdistort
750 facew =FNrnd( 0.6,1.0)
760 faceh =FNrnd( 0.6,1.0)
770 round =FNrnd(-0.5,1.5)
780 eyed  =FNrnd(-30,30)
790 eyew  =FNrnd(0.6,1.2)
800 eyeh  =FNrnd(0.6,1.2)
810 nosew =FNrnd(0.5,1.7)
820 noseh =FNrnd(0.6,1.0)
830 mouthw=FNrnd(0.5,1.5)
840 mouthh=FNrnd(0.5,1.4)
850 earw  =FNrnd(0.3,1.5)
860 earh  =FNrnd(0.3,1.0)
870 browh =FNrnd(0.6,1.25)
880 chinh =FNrnd(1.0,1.25)
890 browd =FNrnd(0,60)
900 c1=(2*round-1)/1024   :c1fw=c1*face
w
910 c2=1.5-round          :c2fw=c2*face
w
920 FOR i=1 TO refs-1
930 dx?i=?rx+(rx?i-?rx)*(c1fw*?ry+c2fw
)
940 dy?i=?ry+(ry?i-?ry)*facew
950 NEXT
960 dx?1=dx?1+eyed/4
970 dx?2=dx?2-eyed/4
980 FOR i=0 TO points-1
990 X%=?rx+(fx?i-?rx)*(c1fw*fy?i+c2fw)
1000 Y%=?ry+(fy?i-?ry)*faceh
1010 IFEVAL("FN"+STR$(opts?i AND &7F))
1020 x1=datax?i:xx=(X%-x1)/steps
1030 y1=datay?i:yy=(Y%-y1)/steps
1040 FOR j=0 TO steps-1
1050 x1=x1+xx:datax?(j*512+i)=x1
1060 y1=y1+yy:datay?(j*512+i)=y1
1070 NEXT
1080 NEXT
1090 ENDPROC
1100 :
1110 DEF FN1
1120 X%=dx?1+(X%+eyed/4-dx?1)*eyew
1130 Y%=dy?1+(Y%-dy?1)*eyeh
1140 =0
1150 :
1160 DEF FN2
1170 IFFN1
1180 Y%=Y%-browd/4
1190 =0
1200 :
1210 DEF FN3
1220 X%=dx?2+(X%-eyed/4-dx?2)*eyew
1230 Y%=dy?2+(Y%-dy?2)*eyeh
1240 =0
1250 :
1260 DEF FN4
1270 IFFN3
1280 Y%=Y%-browd/4
1290 =0
1300 :
1310 DEF FN5
1320 DEF FN6
1330 DEF FN7
1340 X%=dx?3+(X%-dx?3)*nosew
1350 Y%=dy?3+(Y%-dy?3)*noseh
1360 =0
1370 :
1380 DEF FN8
1390 DEF FN9
1400 DEF FN10
1410 X%=dx?4+(X%-dx?4)*mouthw
1420 Y%=dy?4+(Y%-dy?4)*mouthh
1430 =0
1440 :
1450 DEF FN11
1460 X%=dx?5+(X%-dx?5)*earw
1470 Y%=dy?5+(Y%-dy?5)*earh
1480 =0
1490 :
1500 DEF FN12
1510 X%=dx?6+(X%-dx?6)*earw
1520 Y%=dy?6+(Y%-dy?6)*earh
1530 =0
1540 :
1550 DEF FN13
1560 DEF FN16
1570 =0
1580 :
1590 DEF FN15
1600 Y%=dy?7+(Y%-dy?7)*browh
1610 =0
1620 :
1630 DEF FN14
1640 DEF FN17
1650 DEF FN18
1660 Y%=dy?8+chinh*(Y%-dy?8)
1670 =0
```

CHORDS

Listing 1

```
10 REM  !RunImage (Chordsl)
20 REM  by P.E.Marshall
30 REM  for Archimedes only
40 REM  (C) BAU May 92
50 REM
60 ONERROR PROCerror
70 PROCinit_wimp
80 PROCinit_prog
90 ONERROR PROCerror
100 REPEAT
110 PROCpoll
120 UNTIL quit=TRUE
130 PROCshutdown
140 END
150 :
160 DEF PROCinit_wimp
170 DIM block% 1024
180 DIM menu1% 255, menu2% 255,menu3%
255,menu4% 255
190 SYS"Wimp_Initialise" ,200,&4B53415
4,"Chords" TO version,task
200 DIM sequence% 255,delay% 8
210 $sequence%="C F G7 C"
220 $delay%="15"
230 quit=FALSE
240 arp=FALSE
250 PROCiconbar
260 PROCsetup_windows
270 PROCinfo
280 PROCsetup_menu1
290 PROCsetup_menu2
300 PROCsetup_menu3
310 PROCsetup_menu4
320 PROCdeficons
330 spritesize=640*90+100
340 DIM sprite% spritesize
350 !sprite%=spritesize
360 sprite%!8=16
370 SYS"OS_SpriteOp",9+256,sprite%
380 ENDPROC
390 :
400 DEF PROCsetup_windows
410 window1=FNcreate(1280,-360,7,12,11
,"",7,14,%1000011)
420 window2=FNcreate(590,-560,7,2,11,"
Chords",7,13,%1111)
430 window3=FNcreate(900,-500,7,2,11,"
Chords Help",7,1,%10000011)
440 PROCopenup(window3,0,0,900,500)
450 PROCshut(window3)
460 ENDPROC
470 :
480 DEF FNcreate(ww,wh,tf,tb,sc,T$,wf,
wb,flags)
490 block%!24=-1:block%!28=flags
500 block%?32=tf:block%?33=tb
510 block%?34=wf:block%?35=wb
520 block%?36=3 :block%?37=2
530 block%?38=sc:block%?39=0
540 block%!40=0 :block%!44=wh
550 block%!48=ww:block%!52=0
560 block%!56=&3D:block%!60=0
570 block%!64=0:block%!68=0
580 $(block%+72)=T$
590 block%!84=0
600 SYS "Wimp_CreateWindow",,block% TO
 handle
610 =handle
620 :
630 DEF PROCsetup_menu1
640 flags=&7000011
650 P%=menu1%
660 PROCmenu_header("Chords",12)
670 PROCmenu_item(&00,window3,flags,"H
elp")
680 PROCmenu_item(&00-arp,-1,flags,"Ar
peggio")
690 PROCmenu_item(&00,menu4%,flags,"De
lay")
700 PROCmenu_item(&02,menu2%,flags,"Se
quence")
710 PROCmenu_item(&80,-1,flags,"Quit")
720 ENDPROC
730 :
740 DEF PROCsetup_menu2
750 P%=menu2%
760 PROCmenu_header("Sequence",64)
770 P%!0=&84
780 P%!4=-1
790 P%!8=&07000119
800 P%!12=sequence%
810 P%!16=-1
820 P%!20=255
830 ENDPROC
840 :
850 DEF PROCsetup_menu3
860 flags=&7000011
870 P%=menu3%
880 PROCmenu_header("Chords",8)
890 PROCmenu_item(&00,info_window,flag
s,"Info")
900 PROCmenu_item(&80,-1,flags,"Quit")
910 ENDPROC
920 :
930 DEF PROCsetup_menu4
940 P%=menu4%
950 PROCmenu_header("5-100",8)
960 P%!0=&84
970 P%!4=-1
980 P%!8=&07000119
990 P%!12=delay%
1000 P%!16=-1
1010 P%!20=8
1020 ENDPROC
1030 :
1040 DEF PROCmenu_header(T$,w)
1050 $P%=T$
1060 P%!12=&070207
1070 P%!16=w*16
1080 P%!20=34
1090 P%!24=8
1100 P%+=28
1110 ENDPROC
1120 :
1130 DEF PROCmenu_item(A%,B%,C%,T$)
1140 P%!0=A%
1150 P%!4=B%
1160 P%!8=C%
1170 $(P%+12)=T$
1180 P%+=24
1190 ENDPROC
1200 :
1210 DEF PROCinfo
1220 DIM infotext 128:P%=infotext
1230 info_window=FNcreate(650,-244,7,2,
11,"Program Info",7,1,%10000011)
1240 miny=-60
1250 RESTORE+1
1260 FOR I%=0 TO 3
1270 READ t$,$P%
1280 PROCcreate_icon(info_window,0,16,1
60,miny,56,t$,&17000039-8+512)
1290 PROCcreate_icon(info_window,P%,170
,640,miny,56,"",&700013D)
1300 miny-=60:P%+=32
1310 NEXT
1320 DATA "Name:","Chords"
1330 DATA "Purpose:","Keyboard Chord Di
ctionary"
1340 DATA "Author:","Paul Marshall, Ant
igua W.I."
1350 DATA "Version:","1.1 January 1992"
1360 PROCopenup(info_window,0,0,650,244
)
1370 PROCshut(info_window)
1380 ENDPROC
1390 :
1400 DEF PROCdeficons
1410 flags=&7013039
1420 miny=-44
1430 FOR I%=1TO15
1440 READ t$
1450 PROCcreate_icon(window2,0,20,190,m
iny,36,t$,flags)
1460 miny-=36
1470 NEXT
1480 miny=-44
1490 FOR I%=1TO15
1500 FOR J%=0TO4:READ t$:NEXT
1510 PROCcreate_icon(window2,0,210,380,
miny,36,t$,flags)
1520 miny-=36
1530 NEXT
1540 miny=-44
1550 FOR I%=1TO4
1560 READ t$
1570 PROCcreate_icon(window2,0,400,570,
miny,36,t$,flags)
1580 miny-=36
1590 NEXT
1600 ENDPROC
1610 :
1620 DATAC,C# (Db),D,Eb,E,F,F# (Gb),G,A
b,A,Bb,B,Rewind,Enter,"Play Seq"
1630 :
1640 DEF PROCcreate_icon(handle,addr,mi
nx,maxx,miny,ht,t$,flags)
1650 block%!0=handle
1660 block%!4=minx
1670 block%!8=miny
1680 block%!12=maxx
1690 block%!16=miny+ht
1700 block%!20=flags
1710 IF addr=0 THEN
1720 $(block%+24)=t$
1730 ELSE
1740 block%!24=addr
1750 block%!28=-1
1760 block%!32=32
1770 ENDIF
1780 SYS"Wimp_CreateIcon",,block%
1790 ENDPROC
1800 :
1810 DEF PROCset_icon(icon)
1820 block%!0=window2
1830 block%!4=icon
1840 block%!8=&200000
1850 block%!12=0
1860 SYS"Wimp_SetIconState",,block%
1870 ENDPROC
1880 :
1890 DEF PROCnew_window
1900 IF NOT active THEN
1910 PROCopenup(window2,340,1000,590,56
0)
1920 PROCopenup(window1,0,360,1280,360)
1930 active=TRUE
1940 ENDIF
1950 ENDPROC
1960 :
1970 DEF PROCopenup(handle,x,y,w,h)
1980 block%!0=handle
1990 block%!4=x:block%!8=y-h
2000 block%!12=x+w:block%!16=y
2010 block%!20=0:block%!24=0
2020 block%!28=-1
2030 SYS "Wimp_OpenWindow",,block%
2040 ENDPROC
2050 :
2060 DEF PROCwrite_window1
2070 MOVEpointer!4,pointer!8
2080 SYS"OS_SpriteOp",28+256,sprite%,"S
CREEN"
2090 ENDPROC
2100 :
2110 DEF PROCpoll
2120 SYS"Wimp_Poll",0,block% TO reason,
pointer
2130 CASE reason OF
2140 WHEN 0:IF active THEN
2150 IF midi THEN PROCmidi_in
2160 IF playing AND NOT INKEY(-10) THEN
 PROCrelease
2170 ENDIF
2180 WHEN 1:PROCredrawwindow
2190 WHEN 2:SYS "Wimp_OpenWindow",,poin
ter
2200 WHEN 3:PROCclose_windows
2210 WHEN 6:PROCclicked
2220 WHEN 9:PROCprocess_menu
```

```
2230 WHEN 17,18:PROCOSmessage
2240 ENDCASE
2250 ENDPROC
2260 :
2270 DEF PROCclicked
2280 button=pointer!8 AND7
2290 handle=pointer!12
2300 icon%=pointer!16
2310 CASE button OF
2320 WHEN 1,4
2330 IF handle=window2 THEN PROCprocess
_icons ELSE PROCnew_window
2340 WHEN 2
2350 IF handle=window1 OR handle=window
2 THEN
2360 SYS "Wimp_CreateMenu",,menu1%,poin
ter!0-64,pointer!4+16
2370 ELSE
2380 SYS "Wimp_CreateMenu",,menu3%,poin
ter!0-64,pointer!4+16
2390 ENDIF
2400 ENDCASE
2410 ENDPROC
2420 :
2430 DEF PROCprocess_icons
2440 IF icon%>=0 AND icon%<=11 THEN
2450 PROCset_icon(key-1)
2460 PROCset_icon(icon%)
2470 key=icon%+1
2480 ENDIF
2490 IF icon%=12 THEN seqptr=1:PROCset_
icon(12):K=INKEY(10):PROCset_icon(12)
2500 IF icon%=13 THEN SYS "Wimp_CreateM
enu",,menu2%,pointer!0-64,pointer!4+16:s
eqptr=1
2510 IF icon%=14 THEN PROCset_icon(14):
PROCplay_sequence(seqptr):PROCset_icon(1
4)
2520 IF icon%>=15 AND icon%<=29 THEN
2530 PROCset_icon(form+14)
2540 PROCset_icon(icon%)
2550 form=icon%-14
2560 ENDIF
2570 IF icon%>=30 AND icon%<=33 THEN
2580 PROCset_icon(inv+30)
2590 PROCset_icon(icon%)
2600 inv=icon%-30
2610 ENDIF
2620 IF button=4 AND (icon%<12 OR icon%
>14) THEN PROCplay
2630 ENDPROC
2640 :
2650 DEF PROCprocess_menu
2660 IF handle=window1 OR handle=window
2 THEN
2670 CASE pointer!0 OF
2680 WHEN 1:arp=arp EOR -1:PROCsetup_me
nu1
2690 WHEN 3:seqptr=1
2700 WHEN 4:quit=TRUE
2710 ELSE
2720 IF pointer!0=1 THEN quit=TRUE
2730 ENDIF
2740 ENDCASE
2750 ENDPROC
2760 :
2770 DEF PROCredrawwindow
2780 LOCAL window
2790 handle=pointer!0
2800 SYS "Wimp_RedrawWindow",,pointer T
O flag
2810 WHILE flag<>0
2820 CASE handle OF
2830 WHEN window1:PROCwrite_window1
2840 WHEN window3:PROCwrite_window3
2850 ENDCASE
2860 SYS "Wimp_GetRectangle",,pointer T
O flag
2870 ENDWHILE
2880 ENDPROC
2890 :
2900 DEF PROCupdate
2910 block%!0=window1
2920 block%!4=0
2930 block%!8=-360
2940 block%!12=1279
2950 block%!16=0
2960 SYS "Wimp_UpdateWindow",,block% TO
 flag
2970 WHILE flag<>0
2980 PROCwrite_window1
2990 SYS "Wimp_GetRectangle",,pointer T
O flag
3000 ENDWHILE
3010 ENDPROC
3020 :
3030 DEF PROCwrite_window3
3040 MOVEpointer!4,pointer!8+510
3050 PRINT'"  Form-              Chord Sy
mbol-            Enter as-"
3060 PLOT0,0,-8
3070 PRINT"  Major               C
                 C"
3080 PRINT"  Minor               Cm or  CM
I                Cm"
3090 PRINT"  Seventh             C7
                 C7"
3100 PRINT"  Major seventh       Cmaj7 or
CMA7             CM7"
3110 PRINT"  Minor seventh       Cm7   or
CMI7             Cm7"
3120 PRINT"  Minor sharp.7       Cm#7 or C
m(+7)            Cm#7"
3130 PRINT"  Augmented           Caug or C
+                C+"
3140 PRINT"  Diminished          Cdim or C
dim7 or C°       Co"
3150 PRINT"  Suspended forth     Csus or C
sus4             Cs or Csus"
3160 PRINT'"  Sharp  #            Flat  b"
3170 PRINT"  Substitute 6,9,11 for 7 as
 required"
3180 PRINT"  Inversions - precede with
1,2,3  eg.  1C 2Cm 3C"
3190 ENDPROC
3200 :
3210 DEF PROCclose_windows
3220 PROCshut(window1)
3230 PROCshut(window2)
3240 PROCshut(window3)
3250 active=FALSE
3260 ENDPROC
3270 :
3280 DEF PROCshut(handle)
3290 block%!0=handle
3300 SYS "Wimp_CloseWindow",,block%
3310 ENDPROC
3320 :
3330 DEF PROCshutdown
3340 PROCclose_windows
3350 PROCshut(info_window)
3360 PROCpoll
3370 SYS"Wimp_CloseDown"
3380 ENDPROC
3390 :
3400 DEF PROCiconbar
3410 block%!0=-1
3420 block%!4=0
3430 block%!8=0
3440 block%!12=68
3450 block%!16=68
3460 block%!20=&3002
3470 $(block%+24)="!Chords"
3480 SYS "Wimp_CreateIcon",,block% TO i
conbar
3490 active=FALSE
3500 ENDPROC
3510 :
3520 DEF PROCOSmessage
3530 reason=block%!16
3540 CASE reason OF
3550 WHEN 0:quit=TRUE
3560 WHEN &400C1:PROCdraw_screen
3570 ENDCASE
3580 ENDPROC
3590 :
3600 DEF PROCerror
3610 !block%=0
3620 $(block%+4)=REPORT$+" at line "+ST
R$ERL+CHR$0
3630 SYS"Wimp_ReportError",block%,1,"CH
ORDS"
3640 IF ERR=&20402 OR ERR=&20403 OR ERR
=&20404 THEN ENDPROC:REM midi Rx errors
3650 PROCshutdown
3660 END
3670 ENDPROC
3680 :
3690 DEF PROCforegnd
3700 SYS"OS_SpriteOp",V0%,V1%,V2%,V3%
3710 ENDPROC
3720 :
3730 DEF PROCbackgnd
3740 SYS"OS_SpriteOp",60+256,sprite%,"S
CREEN" TO V0%,V1%,V2%,V3%
3750 ENDPROC
3760 :
3770 DEF PROCgcol(C%)
3780 SYS"Wimp_SetColour",C%
3790 ENDPROC
3800 :
3810 DEF PROCplay
3820 IF playing THEN PROCrelease
3830 playing=TRUE
3840 IF form=8 THEN flat=FALSE ELSE fla
t=TRUE
3850 CASE key OF
3860 WHEN 2,3,5,7,10,12:flat=FALSE
3870 WHEN 4,9:flat=TRUE
3880 ENDCASE
3890 IF form=15 THEN flat=TRUE
3900 data$=chord_data$(form,inv)
3910 high=FNtoohigh
3920 PROCplay_notes
3930 ENDPROC
3940 :
3950 DEF PROCplay_notes
3960 nokeys=LEN data$
3970 FOR I%=1 TO nokeys
3980 K%=FNdecode+high*12
3990 note_on(I%)=K%
4000 T%=TIME
4010 PROCkey(K%,TRUE)
4020 IF midi THEN SYS"MIDI_TxNoteOn",K%
+59,127
4030 STEREO voice,K%*10-127
4040 SOUND voice,-15,K%*4+49,100:voice=
(voice+1)MOD8+1
4050 IF arp THEN PROCupdate:REPEAT UNTI
L TIME-T%>VAL($delay%)
4060 NEXT
4070 IF NOT arp THEN PROCupdate
4080 ENDPROC
4090 :
4100 DEF PROCrelease
4110 FOR I%=1 TO nokeys
4120 PROCkey(note_on(I%),FALSE)
4130 IF midi THEN SYS"MIDI_TxNoteOff",n
ote_on(I%)+59,0
4140 NEXT
4150 PROCupdate
4160 FOR V%=1TO8:SOUND V%,0,1,1:NEXT
4170 IF midi THEN SYS"MIDI_Init",2
4180 playing=FALSE
4190 ENDPROC
4200 :
4210 DEF FNtoohigh
4220 H%=FALSE
4230 FOR I%=1 TO LEN data$
4240 IF FNdecode>23 THEN H%=TRUE
4250 NEXT
4260 =H%
4270 :
4280 DEF FNdecode
4290 =INSTR(decode$,MID$(data$,I%,1))+k
ey-1
4300 :
4310 DEF PROCplay_sequence(RETURN P%)
4320 seq$=$sequence%
4330 PROCset_icon(key-1)
4340 PROCset_icon(form+14)
4350 PROCset_icon(inv+30)
4360 WHILE FNchar=" "
4370 P%+=1
4380 ENDWHILE
4390 inv=INSTR("123",FNchar):IF inv<>0
THEN P%+=1
4400 t$=FNchar
4410 P%+=1
4420 IF INSTR("#b",FNchar) THEN t$+=FNc
har:P%+=1
4430 key=INSTR("C.C#D.D#E.F.F#G.G#A.A#"
,t$)DIV2+1
4440 IF key=1 THEN key=INSTR("C.DbD.EbE
.F.GbG.AbA.Bb",t$)DIV2+1
4450 t$=""
4460 IF INSTR("1679mM+osu",FNchar) THEN
4470 WHILE INSTR("1679#mM+osu",FNchar)
AND P%<=LEN seq$
4480 t$+=FNchar
4490 P%+=1
4500 ENDWHILE
4510 ENDIF
4520 form=INSTR("...6..7..9..11.M7.M9.+
..susm..m6.m7.m#7m9.o..",t$)DIV 3+1
4530 PROCset_icon(key-1)
4540 PROCset_icon(form+14)
4550 PROCset_icon(inv+30)
4560 IF P%>=LEN seq$ THEN P%=1
4570 IF button=4 THEN PROCplay
4580 ENDPROC
4590 :
4600 DEF FNchar
4610 =MID$(seq$,P%,1)
4620 :
4630 DEF PROCall_keys
4640 FOR K%=0TO25
4650 IF white(K%) THEN PROCplot(64,2,0,
6,84,200,kx(K%),40)
4660 NEXT
4670 FOR K%=0TO25
4680 IF NOT white(K%) THEN PROCplot(40,
6,7,1,48,96,kx(K%),180)
4690 NEXT
4700 ENDPROC
4710 :
4720 DEF PROCkey(K%,down)
4730 CASE TRUE OF
4740 WHEN down AND white(K%):PROCplot(1
6,2,0,6,84,120,kx(K%),40)
4750 WHEN down AND NOT white(K%):PROCpl
ot(8,6,6,1,48,96,kx(K%),180)
4760 WHEN NOT down AND white(K%):PROCpl
ot(64,2,0,6,84,120,kx(K%),40)
4770 OTHERWISE
4780 PROCplot(40,6,7,1,48,96,kx(K%),180
)
4790 ENDCASE
4800 ENDPROC
4810 :
4820 DEF PROCplot(h,c1,c2,c3,w,l,X%,Y%)
4830 PROCbackgnd
4840 VDU5
4850 PROCgcol(c1)
4860 RECTANGLEFILLX%,Y%,w,h
4870 PROCgcol(c2)
4880 RECTANGLEFILL X%,Y%+h,w,l-h
4890 PROCgcol(c3)
4900 MOVEX%,Y%+h:DRAWBY w,0
4910 IF h<32 THEN
4920 PROCgcol(11):CIRCLEFILL X%+w/2,Y%+
h+32,24
4930 PROCgcol(9):MOVE X%+w/2-10,Y%+h+44
4940 PRINT note$(K% MOD 12,flat AND1)
4950 ENDIF
4960 PROCforegnd
4970 ENDPROC
4980 :
4990 DEF PROCdraw_screen
5000 SYS"OS_SpriteOp",15+256,sprite%,"S
CREEN",0,640,90*pmult%,MODE
5010 PROCbackgnd
5020 VDU5
5030 PROCgcol(12):RECTANGLEFILL0,0,1280
,360
5040 PROCgcol(4):RECTANGLEFILL0,48,1280
,200
5050 PROCgcol(13):RECTANGLEFILL0,244,12
80,4
5060 PROCgcol(14):MOVE420,340:PRINT"B B
 C  A C O R N  U S E R"
5070 PROCforegnd
5080 PROCall_keys
5090 ENDPROC
5100 :
5110 DEF PROCinit_prog
5120 SYS "OS_ReadModeVariable",MODE,5 T
O ,,yheight%
5130 IF yheight%=1 THEN pmult%=2 ELSE p
mult%=1
5140 DIM white(25)
5150 white()=-1,-1,0,-1,0,-1,-1,0,-1,0,
-1,0,-1,-1,0,-1,0,-1,-1,0,-1,0,-1,0,-1,-
1
5160 DIM kx(25)
5170 bx=-24
5180 wx=-64
5190 FOR I%=0 TO 25
5200 IF white(I%)=-1 THEN kx(I%)=wx:wx+
=88 ELSE kx(I%)=bx
5210 bx+=51.3
5220 NEXT
5230 DIM form$(15),note$(12,1)
5240 note$()="B","B","C","C","C#","Db",
"D","D","D#","Eb","E","E","F","F","F#","
Gb","G","G","G#","Ab","A","A","A#","Bb",
"B","B"
5250 DIM chord_data$(15,3)
5260 RESTORE+1
5270 FOR I%=1TO15
5280 FOR J%=0TO3
5290 READ chord_data$(I%,J%)
5300 NEXT
5310 READ form$(I%)
5320 NEXT
5330 DIM note_on(16)
5340 key=1
5350 form=1
5360 inv=0
5370 up=1
5380 voice=1
5390 seqptr=1
5400 delay=15
5410 flat=FALSE
5420 playing=FALSE
5430 decode$="123456789ABCDEFGHIJKLMNO"
5440 PROCset_icon(key-1)
5450 PROCset_icon(form+14)
5460 PROCset_icon(inv+30)
5470 PROCdraw_screen
5480 VOICES 8
5490 FOR I%=1 TO 8
5500 VOICE I%,"StringLib-Soft"
5510 NEXT
5520 *TUNING 0
5530 *TUNING 80
5540 midi=FNmidi
5550 ENDPROC
5560 :
5570 DEF PROCmidi_in
5580 SYS"MIDI_RxCommand" TO S%
5590 IF S%<>0 THEN
5600 note=((S%>>8 AND &FF)-59)
5610 IF note<26 AND note>=0 THEN
5620 PROCkey(note,(S%>>16 AND &FF)<>0)
5630 PROCupdate
5640 ENDIF
5650 ENDIF
5660 ENDPROC
5670 :
5680 DEF FNmidi
5690 LOCAL ERROR
5700 ON ERROR LOCAL :=FALSE
5710 SYS "OS_SWINumberFromString",0,"MI
DI_SoundEnable" TO M%
5720 SYS "MIDI_Init",0
5730 SYS "MIDI_SetBufferSize",0,&1000
5740 =TRUE
5750 :
5760 DATA 158,58D,8DH,DHK,Major
5770 DATA 158A,58AD,8ADH,ADHK,6
5780 DATA 158B,58BD,8BDH,BDHK,7
5790 DATA 58BF,8BFH,BFHK,358B,9
5800 DATA 8BFI,BFIK,368B,68BF,11
5810 DATA 158C,58CD,8CDH,CDHK,Major 7
5820 DATA 58CF,8CFH,CFHK,358C,Major 9
5830 DATA 159,59D,9DH,DHL,Augmented
5840 DATA 168,68D,8DI,DIK,Suspend.4
5850 DATA 148,48D,8DG,DGK,minor
5860 DATA 148A,48AD,8ADG,ADGK,minor 6
5870 DATA 148B,48BD,8BDG,BDGK,minor 7
5880 DATA 148C,48CD,8CDG,CDGK,minor #7
5890 DATA 48BF,8BFG,BFGK,FGKN,minor 9
5900 DATA 147A,47AD,7ADG,ADGJ,Diminishe
d
5910 :
5920 DATA Root,1st inv,2nd inv,3rd inv
```

Listing 2

```
10 REM >Chords (Chords2)
20 REM Chords for keyboards
30 REM By P.E.Marshall
40 REM For B/B+/M/C
50 REM (c) BAU May 92
60 :
70 MODE7
80 FOR I=0TO1
90 VDU141,132,157,135:PRINTTAB(7)"Cho
rds for Keyboards"
100 NEXT
110 PRINT'"  CURSOR keys"+CHR$134+"
Select from menus"
120 PRINT "  RETURN"+CHR$134+"
Play selected chord"
130 PRINT "  f0"+CHR$134+"
Enter/edit sequence"
140 PRINT"     (insert editing using cu
rs/del/ret)"
150 PRINT "  SPACE"+CHR$134+"
Play next in sequence"
160 PRINT'"  Shift + ESC"+CHR$129+"
Exit program"
170 PRINT'CHR$130+"Form-           Chor
d Symbol-    Enter-"
180 PRINT" Major           C
    C"
190 PRINT" Minor           Cm or CMI
    Cm"
200 PRINT" Seventh         C7
    C7"
210 PRINT" Major 7th       Cmaj7 or CMA
7    CM7"
220 PRINT" Minor 7th       Cm7   or CMI
7    Cm7"
230 PRINT" Augmented       Caug or C+
    C+"
240 PRINT" Diminished      Cdim or Cdim
7    Co"
250 PRINT" Suspended 4th  Csus or Csus
4    Cs"
260 PRINT" (substitute 6,9,11 for 7 as
 required)"
270 PRINTCHR$131+"Inversions "+CHR$134
+"precede by 1,2,3  eg 1C"
280 PRINTTAB(23,23)CHR$132+"Press a ke
y...";
290 G=GET
300 IF HIMEM<&8000 AND PAGE>&1300 THEN
 PAGE=&1300
310 CHAIN"Chords2"
```

Listing 3

```
10 REM >Chords2 (Chords3)
20 REM By P.E.Marshall
30 REM for B/B+/M/C
40 REM (c) BAU May 92
50 :
60 ONERROR GOTO720
70 MODE1
80 PROCinit
90 REPEAT
100 REPEAT
110 Q%=INKEY(0)
120 IF Q%=138 AND val%(menu)<items THE
N old=val%(menu):val%(menu)=val%(menu)+1
:PROCtick(old,menu):PROCtick(val%(menu),
menu)
130 IF Q%=139 AND val%(menu)>1 THEN ol
d=val%(menu):val%(menu)=val%(menu)-1:PRO
Ctick(old,menu):PROCtick(val%(menu),menu
)
140 IF Q%=137 OR Q%=136 THEN PROCtick(
0,menu):menu=(menu+138-Q%)MOD3:items=men
u%(3,menu):PROCtick(0,menu)
150 IF Q%=240 PROCinput:seqptr=1
160 UNTIL Q%=32 OR Q%=13
170 key=val%(0):form=val%(1):inv=val%(
2)
180 IF Q%=13 THEN PROCplay
190 IF Q%=32 THEN PROCplay_seq:val%(0)
=key:val%(1)=form:val%(2)=inv
200 UNTIL FALSE
210 :
220 DEF FNtoohigh
```

```
230 H%=FALSE
240 FOR I%=1 TO LEN data$
250 K%=FNdecode:IF K%>23 THEN H%=TRUE
260 NEXT
270 =H%
280 :
290 DEF FNdecode
300 =INSTR(decode$,MID$(data$,I%,1))+key-1
310 :
320 DEF PROCkey(K%,dn%)
330 IF dn% AND wht%?K% PROCplot(16,3,0,84,120,kx%(K%),40):ENDPROC
340 IF NOT dn% AND wht%?K% PROCplot(64,3,0,84,120,kx%(K%),40):ENDPROC
350 IF dn% AND wht%?K%=0 PROCplot(8,0,3,64,96,kx%(K%),180):ENDPROC
360 IF NOT dn% AND wht%?K%=0 PROCplot(40,0,3,64,96,kx%(K%),180)
370 ENDPROC
380 :
390 DEF PROCplot(H%,C%,D%,W%,L%,X%,Y%)
400 GCOL0,C%:PROCfill(X%,Y%,W%,L%)
410 GCOL0,D%:MOVEX%,Y%+H%:PLOT1,W%,0
420 MOVEX%,Y%:PLOT1,0,L%
430 IF H%>32 ENDPROC
440 GCOL4,0:MOVE X%+W%/2-28,Y%+H%+44
450 IF flat PRINTMID$(nameB$,K%*2,2) ELSE PRINTMID$(nameA$,K%*2,2)
460 ENDPROC
470 :
480 DEF PROCall_keys
490 FOR K%=0TO25:IF wht%?K% THEN PROCplot(64,3,0,84,200,kx%(K%),40)
500 NEXT
510 FOR K%=0TO25:IF wht%?K%=0 THEN PROCplot(40,0,3,64,96,kx%(K%),180)
520 NEXT
530 ENDPROC
540 :
550 DEF FNchar
560 =MID$($seq%,P%,1)
570 :
580 DEF PROCtick(P%,M%)
590 Y%=menu%(1,M%)-P%*36-8
600 IF P%=0 GCOL3,1 ELSE GCOL3,3:Y%=Y%-12
610 MOVE menu%(0,M%)+12,Y%:VDU255
620 ENDPROC
630 :
640 DEF PROCrect(X%,Y%,W%,H%)
650 MOVEX%,Y%:PLOT1,0,H%:PLOT1,W%,0:PLOT1,0,-H%:PLOT1,-W%,0
660 ENDPROC
670 :
680 DEF PROCfill(X%,Y%,W%,H%)
690 MOVEX%,Y%:PLOT0,0,H%:PLOT81,W%,-H%:PLOT81,0,H%
700 ENDPROC
710 :
720 IF ERR=17 AND NOT INKEY(-1) THEN VDU5:seqptr=1:GOTO90
730 MODE0:REPORT:PRINTERL
740 *FX4,0
750 *FX225,1
760 END
770 :
780 DEF PROCinput
790 VDU4:P%=0
800 REPEAT
810 L%=LEN $seq%
820 PRINTTAB(0,18)$seq%+" ";STRING$(L%-P%+1,CHR$8);
830 G%=GET
840 IF G%>31 AND G%<127 AND L%<159 $seq%=LEFT$($seq%,P%)+CHR$G%+RIGHT$($seq%,L%-P%):P%=P%+1
850 IF G%=137 AND P%<L% P%=P%+1
860 IF G%=136 AND P%>0 P%=P%-1
870 IF G%=127 AND P%>0 $seq%=LEFT$($seq%,P%-1)+RIGHT$($seq%,L%-P%):P%=P%-1
880 UNTIL G%=13:VDU5
890 ENDPROC
900 :
910 DEF PROCplay_seq
920 PROCtick(key,0):PROCtick(form,1):PROCtick(inv,2)
930 P%=seqptr-1
940 REPEAT:P%=P%+1:UNTIL FNchar<>" "
950 inv=INSTR("123",FNchar)+1:IF inv<>1 P%=P%+1
960 t$=FNchar:P%=P%+1
970 IF FNchar="b" OR FNchar="#" THEN t$=t$+FNchar:P%=P%+1
980 key=INSTR("C.C#D.D#E.F.F#G.G#A.A#",t$)DIV2+1
990 IF key=1 THEN key=INSTR("C.DbD.EbE.F.GbG.AbA.Bb",t$)DIV2+1
1000 t$=""
1010 IF INSTR("1679mM+osu",FNchar) THEN REPEAT:t$=t$+FNchar:P%=P%+1:UNTIL INSTR("1679#mM+osu",FNchar)=0 OR P%>LEN $seq%
1020 form=INSTR("...6..7..9..11.susM7.M9.+..m..m6.m7.m9.o",t$)DIV 3+1
1030 PROCtick(key,0):PROCtick(form,1):PROCtick(inv,2)
1040 IF P%>=LEN $seq% THEN P%=1
1050 PROCplay:seqptr=P%
1060 ENDPROC
1070 :
1080 DEF PROCplay
1090 flat=TRUE
1100 IF form=9OR key=2OR key=3OR key=5OR key=7OR key=10OR key=12 flat=FALSE
1110 IF key=4 OR key=9 OR form=14 flat=TRUE
1120 data$=data$(form-1,inv-1)
1130 high=FNtoohigh
1140 FOR I%=1 TO LEN data$
1150 TIME=0
1160 K%=FNdecode+high*12
1170 REM Send K%+59,127 to your midi
1180 PROCkey(K%,TRUE):SOUND &10+voice,1,K%*4+49,100
1190 REPEAT UNTIL TIME>delay%
1200 voice=(voice+1)MOD3+1
1210 NEXT
1220 REPEAT UNTIL NOT INKEY(-99) AND NOT INKEY(-74)
1230 *FX15,0
1240 FOR I%=1 TO LEN data$
1250 K%=FNdecode+high*12
1260 PROCkey(K%,FALSE)
1270 REM Send K%+59,0 to your midi
1280 NEXT
1290 ENDPROC
1300 :
1310 DEF PROCinit
1320 delay%=15
1330 decode$="123456789ABCDEFGHIJKLMN"
1340 DIM wht% 25
1350 FOR I%=0TO25:READ wht%?I%:NEXT
1360 DATA -1,-1,0,-1,0,-1,-1,0,-1,0,-1,0,-1,-1,0,-1,0,-1,-1,0,-1,0,-1,0,-1,-1
1370 DIM kx%(25)
1380 bx=-24:wx=-64
1390 FOR I%=0 TO 25
1400 IF wht%?I% THEN kx%(I%)=wx:wx=wx+88 ELSE kx%(I%)=bx
1410 bx=bx+51.3
1420 NEXT
1430 nameA$=" C C#D D#E F F#G G#A A#B":nameA$=nameA$+nameA$
1440 nameB$=" C DbD EbE F GbG AbA BbB":nameB$=nameB$+nameB$
1450 DIM menu%(3,2)
1460 FOR J%=0TO2:FOR I%=0TO3:READ menu%(I%,J%):NEXT:NEXT
1470 DATA 0,1023,300,12
1480 DATA 400,1023,400,14
1490 DATA 900,1023,340,4
1500 DIM data$(13,3)
1510 RESTORE1880
1520 FOR I%=0TO13:FOR J%=0TO3
1530 READ data$(I%,J%)
1540 NEXT:READ dummy$:NEXT
1550 DIM val%(3)
1560 key=1:form=1:inv=1
1570 val%(0)=key:val%(1)=form:val%(2)=inv
1580 voice=1
1590 *FX4,1
1600 *FX225,240
1610 ENVELOPE1,5,0,0,0,0,0,0,120,-5,-2,-20,120,80
1620 VDU23,255,1,3,7,142,220,248,112,32
1630 VDU23,0,10,64,0;0;0;
1640 IF HIMEM>&3000 THEN DIM seq% 160 ELSE seq%=&A00
1650 $seq%="C F G7 C"
1660 PRINTTAB(0,18)$seq%:seqptr=1
1670 GCOL0,1:PROCfill(0,0,1280,380)
1680 GCOL0,2:VDU5:MOVE420,360:PRINT"BBC ACORN USER":VDU4
1690 PROCall_keys
1700 RESTORE1840
1710 FOR I%=0TO2:PROCshowmenu(I%):PROCtick(1,I%):NEXT
1720 menu=0:items=menu%(3,menu):PROCtick(0,menu)
1730 ENDPROC
1740 :
1750 DEF PROCshowmenu(M%)
1760 X%=menu%(0,M%):Y%=menu%(1,M%)
1770 W%=menu%(2,M%):Z%=menu%(3,M%)
1780 VDU5:GCOL0,2:PROCrect(X%,Y%,W%,-48)
1790 PROCrect(X%,Y%,W%,-36*Z%-60)
1800 GCOL0,3:MOVE X%+48,Y%-12:READ t$:PRINT t$
1810 FOR N%=1 TO Z%:MOVE X%+48,Y%-(36*N%)-24:READ t$:PRINTt$:NEXT
1820 ENDPROC
1830 :
1840 DATARoot,C,C# (Db),D,Eb,E,F,F# (Gb),G,Ab,A,Bb,B
1850 DATAChord Form,Major,6,7,9,11,Sus4,Major 7,Major 9,Augmented,minor,minor 6,minor 7,minor 9,Diminished
1860 DATAInversion,Root,1st,2nd,3rd
1870 :
1880 DATA 158,58D,8DH,DHK,Major
1890 DATA 158A,58AD,8ADH,ADHK,6th
1900 DATA 158B,58BD,8BDH,BDHK,7th
1910 DATA 58BF,8BFH,BFHK,358B,9th
1920 DATA 8BFI,BFIK,368B,68BF,11th
1930 DATA 168,68D,8DI,DIK,Sus 4th
1940 DATA 158C,58CD,8CDH,CDHK,Maj 7
1950 DATA 58CF,8CFH,CFHK,358C,Maj 9
1960 DATA 159,59D,9DH,DHL,Aug
1970 DATA 148,48D,8DG,DGK,minor
1980 DATA 148A,48AD,8ADG,ADGK,min 6
1990 DATA 148B,48BD,8BDG,BDGK,min 7
2000 DATA 48BF,8BFG,BFGK,FGKN,min 9
2010 DATA 147A,47AD,7ADG,ADGJ,Dim
```

ARM PROGRAMMING

Listing 1

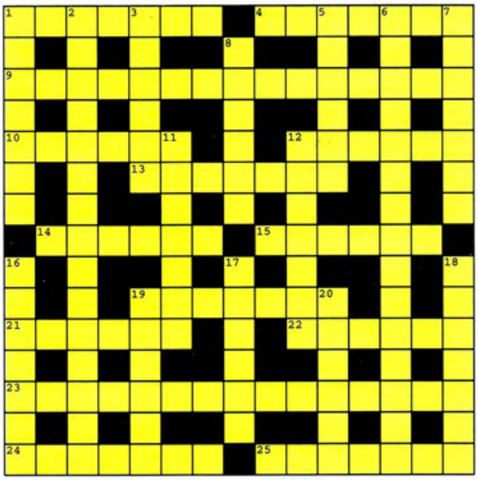
```
10 REM >ARM1 (ArmProg1)
20 REM By Dave Lawrence
30 REM For 32 bit machines
40 REM (C) BAU April 1992
50 :
60 DIM code 100
70 link=14
80 pc=15
90 FOR pass=0 TO 2 STEP 2
100 P%=code
110 [OPT pass
120 .negtest
130         MOV     R0,#3
140         MVN     R1,#NOT -5
150         MUL     R2,R0,R1
160         RSB     R1,R1,#1
170         ADD     R0,R1,R2
180         MOV     pc,link
190 ]NEXT
200 PRINT "Press SPACE to run code";
210 IFGET
220 PRINT '"R0=";USR(negtest)
```

Listing 2

```
10 REM >ARM2 (ArmProg2)
20 REM By Dave Lawrence
30 REM For 32 bit machines
40 REM (C) BAU April 1992
50 :
60 DIM code 100
70 link=14
80 pc=15
90 FOR pass=0 TO 2 STEP 2
100 P%=code
110 [OPT pass
120 .negtest
130         MOV     R0,#255
140         MOV     R1,#516
150         MOV     R4,#65536
160         MOV     R5,#99614720
170         MOV     R9,#100000000
180         MOV     R2,#64
190         MOV     pc,link
200 ]NEXT
210 PRINT "Press SPACE to run code";
220 IFGET
230 PRINT '"R0=";USR(negtest)
```

NOTES

BBC Acorn User cryptic crossword, April 92



Across

1 Following revolution, Tsarina becomes a mechanic! (7)
4 Policeman needs dark Chinese force to reveal a forger's skill (7)
9 "Might Sir fall out?" "From this, Sir surely won't!" (6,9)
10 Many singers are so rich, but twisted... (6)
12 ...they're all made greedy to some extent! (6)
13 Made cryptic notes about officer (7)
14 I am left on the quay? (6)
15 One who might streak about on the ice (6)
19 A sore back? There's nothing left but this spray! (7)
21 What early Sixteenth century records often looked like (6)
22 Peter has white material (6)
23 The BBC, for example, manufacture internally, bottom brackets for the bulk of electronic components (15)
24 The French model is indeed discontinued (7)
25 Spinster has purpose in exploits . . . (7)

Down

1 . . . that concerns church uprising amidst staff reform (7)
2 Motoring article about something to do with ratios? (15)
3 When stung by the wasp, he reacted by hiding the ball! (6)
5 Carefully hidden, I follow student into flat (6)
6 Readings from tarot inspire ten to reform (15)
7 Heavy metal supporters (7)
8 What you might look through to find your files (6)
11 Wind instrument made from tin, gold and a chunk of nickel (7)
12 A place for the environmentally friendly? (7)
16 Taken for granted that Sue's mad and deranged! (7)
17 Universal magazines? (6)
18 One ploy in five starts spreading infections (7)
19 Nearly the majority of all . . . . . . and all of the majority! (6)
20 These could lessen distortion (6)

Chambers 20th century dictionary is recommended. Send your completed entries to *BBC Acorn User*, 20-26 Brunswick Place, London N1 6DJ to reach us by Friday February 10 1992. Photocopies of your solution are acceptable.

The solution (and winner) will be published in the June issue. Meanwhile the winner of February's crossword (answer shown right) is Paul Chaplin of King's Lynn.

Last month's solution



Circular arguments?

It will soon be summer again and once more fields all over the West Country will be full of crops, meteorologists, psychics and sceptics. Will Doug Bower and Dave Chorley be 'at it' again with pole, plank and string? Will the Plasma Vortex rear its ugly head or will Jimmy Page merely be out with his Box Brownie in search of album covers. Who knows?

But until the first circular speciality this year, perhaps you'd like to have a go at what Doug and Dave did with our specially written one-liner. Type in the listing as it is and squash it with the key definition below – the program won't run properly on multiple lines. The program will run on all Acorn machines and will present you with a beautiful field of golden corn swaying gentle in the summer breeze. Doug and Dave are represented by small dots and start off in the bottom left hand corner. G, H, J and I will move them, and, naturally D swaps between who you are guiding. Pressing L will flatten the corn in a straight line between the two hoaxers and the O will make a mystical circle with the selected man at the edge and the other at its epicentre. Rings can be formed by creating a second circle within the first – the pranxters will magically stand all the corn upright again.

Complex patterns can, of course, be formed by combining these basic shapes. If anyone creates any particular masterpieces, we at the puzzle page would be delighted to see your efforts...

```
10 MODE1
20 VDU19;3;0;19,3,2;0;
30 DIMx(1),y(1)
40 REPEAT
50 GCOL3,1
60 REPEAT
70 k=INKEY0-68
80 n=-(k=0)EORn
90 X=x(n)
100 Y=y(n)
110 x=x(1-n)
120 y=y(1-n)
130 PLOT69,X,Y
140 PLOT69,x,y
150 x(n)=X+4*((k=3)-(k=4
    ))
160 y(n)=Y+4*((k=6)-(k=5
    ))
170 r=SQR((X-x)^2+(Y-y)^
    2)
180 PLOT69,X,Y
190 PLOT69,x,y
200 UNTILk>7
210 GCOL0,3-POINT(x,y)
220 IFk=8DRAWX,Y
230 UNTIL0ELSEFORa=0TO36
    0
240 MOVEx,y
250 PLOT81,r*SINRADa,r*C
    OSRADa
260 NEXT
270 UNTIL0
```

```
*KEY0 f=PA.+4:t=f:b=&F5:REP.c=(b<>&F5):?t=-?t*NOTc-58*
c:t=t-c:x=f?-1:FOR i=1TOx-4:b=?f:?t=b:f=f+1:t=t+1:N.:f
=f+4:U.f?-3=&FF:?t=&D:t?1=&FF:?(PA.+3)=t-PA.|M
```

Function key definition to squash listings on to one line.

'O' Dear!

John Fletcher of Prestwich, Manchester has a challenge for you. Here are 12 words with their 'O's removed. Can you figure out what the words should be? While you do that, John can work out what to do with his £10 note!

FFSHTRTHDX PRTCLLKUT STRERMDRUS

FRENNFTLSE RATRICTTNWD MNTNUSSCILGY

(see solution next month)

Solutions to March's mixed bag anagrams

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FREE ADS

Due to a large backlog of ads, there is no coupon this month. A coupon will be published in next month's issue of BAU

● **Bargain Beeb! BBC B with** DFS and drive, mouse, most with boxes, Only £150 o.n.o. Will haggle. Contact Jamie Prady, Carnforth, Lancs. Tel: (0524) 781195

● **A410/1, 4Mb, 30MHz** Arm3, VIDC Enhancer, Oak 70Mb internal disc, Scsi Card, A5000 Multi Sync – serious offers. Contact C. Ducker, Surrey. Tel: (0276) 20575

● **BBC B with Opus disc** drive, View, Viewsheet, Logo Chips – £265 o.n.o. Leighton Jones, Bristol (0761) 412593

● **A310, 4Mb, colour monitor,** 220Mb hard disc – £700, Epson LQ400 & sheet feeder– £170, BBC B, 40T drive, etc. – £150. Contact: Richard paddle, Paignton. Tel (0803) 557843

● **A3000, serial port, Acorn** colour monitor and PRM – £600, A3000 plus monitor – £500 Contact Colin Pouton, Bristol. Tel (0272) 550971

● **BBC B, Twin disc drive,** Spare disc drive, colour monitor, Watford DFS, BBC Cassette data recorder, many games – £320, Contact Keith Ashman. Tel: (0923) 222563

● **A3000 LC, 2Mb, colour** monitor, original discs and manuals, Pres housing with extra software –£900 F. Duhig, London. Tel: (081) 3115545

● **Acorn controller + 20 Mb** hard disc – £130, Ram/Rom podule with 96K of Ram for Archimedes – £30, 512 co-processor – £80, 6SC102 turbo for BBC – £60. Contact Neil Newman, Farningham. Tel: (0322) 862397

● **Electron API and AP3,** Dumpout 3, back copies of Electron User, Viewstore, approx. 35 games. Contact Michael Holloway, High Wycombe. Tel: (0494) 437672

● **BBC B accessories, 6502** 2nd processor – £75, Watford 128K Rom/Ram board – £60. Spellmaster Chip and manual – £3. Tel: (0283) 815928

● **A3000, Acorn 2Mb** upgrade, Phillips monitor, Acorn monitor stand, £300 pounds worth of software 12 months old, mint condition – £700 o.v.n.o. Contact Nathan Thorpe, Leicester. Tel: (0533) 353448

● **Archimedes A440, colour** monitor, 5.25in twin disc interface, Ansi C, First Word Plus, Interdictor II, programmer's reference manuals – £950. Contact Peter Haynes, Abingdon. Tel: (0235) 525996

● **BBC B, dual 40/80 external** disc drive, View III word processor, Phillips B/W monitor, cassette and assorted games – £450 o.n.o. Contact Mrs C. Moules, 27 Alexandra Ro ad, Stotfeld, Hitchin, Herts, SG5 4NA

● **Basic BBC B, Issue 7, 30** games, educational software, joystick, tape recorder, excellent condition – £75 o.n.o. Contact Mr D. Tucker, Solihull. Tel: (0564) 779713

● **Smart cartridge – £18,** Elite – £7, Speech – £5, Twin joysticks – £10, Repton – £5, AMX Superart+mouse – £40. All BBC Master. Tel: (0452) 760408

● **BBC Master compact, sin**gle 40/80 disc drive with manuals – £250 o.n.o. Contact Mr S. Dumford, Nuneaton. Tel: (0455) 291015

● **BBC B, dual 40/80 disc** drive, wordwise, spellmaster, manuals, books, magazines, joystick, mini office II mouse – £150. Contact N. Mozakka, London. Tel: 071- 482 5948

● **A3000, mono monitor, ser**ial interface, Pres 5.25in disc interface – £550. Contact Michaek Morley, Cheshire. Tel: (061) 973 8063.

● **Watford 2m upgrade for** A310 plus manual, fitting tool – £60 o.n.o. Contact Elwyn Morris, Essex. Tel : (0255) 506303 (evenings)

● **Master 128, disc drive,** joysticks, games, books – £295 o.n.o. Contact Mr B. Goodall, Cheshire. Tel: (0663) 746886

● **BBC B Acorn DFS, dual** drive, wordwise, oxford pascal games – £250. Contact P. Cooper, Tel : 081-783 1621. Evenings only (not weekends).

● **A440/1, Taxan monitor** – £1275. Pres A3000 Plinth with 75Mb SCSI H disc + board – £330. 3.5 D drive – £50. Genesis, Logistix, Atelier, 4vol Riscos manuals. Contact J Huter, Somerset. Tel: (0458) 250130

● **BBC B, disc DFS interface,** Phillips 12in green monitor, disc drive, games – £250. Contact Luke, Portsmouth .Tel; (0705) 865455 BBC B with 1772 DFS, microvitec CUB, medium resolution monitor, tape recorder, extras, all in original boxes. Contact Mr R. Emmerson, 091-4171324

Opening Hours Monday-Saturday 10.00 to 18.00

MegaUtils £10+VAT



A set of RISCOS utilities providing a whole host of genuinely useful, time-saving functions for all users alike, all at the touch of a button. The disc includes;

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!CleanUp A hot key utility for instantly redrawing window(s).

!Disable Prevents you from deleting any file whilst enabled.

!DOSForm A multi-tasking DOS 720k formatter with verify.

!FileMon Displays all the information related to any file.

!LineClock A desktop clock that can be placed anywhere.

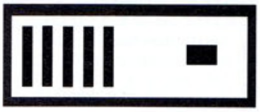
!MegaUtils provides a window organiser for arranging filer and/or application windows on the desktop, key short-cuts to open/close filer windows, set copy and wipe options, set filetypes, quick loading of basic programs, caret flasher, selection of mouse speed, automatic opening of application directories without using shift, mouse hider, caret grabbing.

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180Mb 18ms Cache	£449
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520Mb 12ms Cache	£999

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20Mb	£199
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SCSI

The following are complete SCSI HardDisc Systems comprising of a Morley SCSI interface, HardDisc, mounting brackets, cables, utilities disc and manual.

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50Mb 17ms Cache	£339
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520Mb 12ms Cache	£1049

A3000/A300/A400 External

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105Mb 18ms Cache	£509
180Mb 18ms Cache	£699
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520Mb 12ms Cache	£1149

External drives are housed in slimline colour co-ordinated case complete with integral power supply and fan. Internal Hard cards are RISC Developments units.

Archimedes, A3000, A5000 Software

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Caverns (Minerva)	£14
Chequered Flag (CIS)	£19
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(Please specify age group)	
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Things to do with Words (SS)	£19
Turtles "World Tour"	£15
Words and Pictures (Chalk)	£18
World Scape (Eclipse)	£15

Please contact us if you are offered a better price elsewhere, we will do our best to match it.
We operate the Acorn Teachers Scheme & 0% Finance Schemes.
This advert was produced using Impression & Draw!

Tel: 061-474 0778

Access VISA

APR 92

OPEN SYSTEMS INTER NETWORKING

Acorn have had the foresight to write software to allow common links to many types of machines.

The protocol which allows this is TCP/IP (Transport Control Protocol/Internet Protocol). This defines the packets which travel over Ethernet.

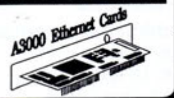
Chameleon sell products which allow Terminal emulation, File Transfer, X Windows terminals and allow you to use the hard disk on a Sun type Network file system (NFS).

These products let us link : ACORN, APPLE, IBM PC and most UNIX machines also usefully connect to Novell Fileservers.

Please do not hesitate to contact us to discuss your connectivity problems (UNIX not required)

ECONET IS DEAD - LONG LIVE ETHERNET!

At last the A3000 has an Ethernet Adaptor! This means that all ACORN Risc machines can be internetworked leaving Econet to the trusty 6502.



UNIX MACHINES PRICE DECREASE!



ACORN R225 ARM3 4Mb RAM Discless Ethernet....£ 1830.00

ACORN R260 ARM3 8Mb RAM 100 Mb hard Disc...£3495.00

ACORN R140 ARM2 4Mb RAM Now discontinued, we usually have traded-in R140s for sale!

UNIX UPGRADES

R140 OWNERS (If covered by Microcare)..........£349.00
(Microcare expired)....................£399.00

A440 / 540 etc. £999.00

If you want to run RISC iX 1.2 on your Acorn Archimedes, we are offering an upgrade service. This latest version of ACORN UNIX requires 100 Mb, an ACORN SCSI card and 4Mb of memory. We can arrange for it to be installed on your current 100Mb SCSI anywhere in the UK mainland. Alternatively it can be purchased pre-installed on the WARP DRIVE ready for use.

This is the same version of UNIX as supplied on the R260.

UNIX STORAGE *(Also RISC OS)*

In our search for the fastest drive to support RISC iX (Acorn's UNIX), we have produced the Warp Drive a high performance SCSI drive in conjunction with Acorn's SCSI controller card included in R260 computers or an extra £220+VAT if your machine is not already fitted. These devices will work with other controllers but UNIX will not.



Size	Speed	External	Internal
105Mb	9ms	£ 410	£ 310
210Mb	9ms	£ 675	£ 575
420Mb	12ms	£1095	£ 995
676Mb	16ms	£1315	
1000Mb	15ms	£1735	
1600Mb	16ms	£2050	

NEW: SCSI Tape Streamers 150Mb or 525Mb
Two year warranty on all Warp Drives

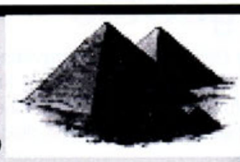
All Prices add VAT @ 17.5% (15%+2.5% Poll Tax subsidy)

For the Serious Acorn User

CHAMELEON COMPUTERS LTD.

Stowell Technology Centre
Montford Street
Salford M5 2SE
TEL (061) 745 9849

Pyramid Computer Services
16 Borough Crescent
Stourbridge
West Midlands DY8 3UT
Telephone & Fax: 0384 396739



Carriage Charges: (a) £1.50 (b) £2.50 (c) £4.00 (d) £10.00 (e) £15.00 (f) £20.00
Please add carriage charges as shown and then VAT @ 17½%. Callers by appointment only please. Educational Orders welcomed. All offers are subject to availability. E. & O. E.

Software

Fun School 3 (under 5s 5-7s or over 7s)	£17.50 a
Armadeus	£57.25 a
1st Word Plus release 2	£60.00 b
Easiwriter	£116.00 c
Protext V5	£110.00 c
Impression 2	£130.00 c
Impression Junior	£67.00 b
Revelation 2	£108.00 c
Ovation	£81.00 c
Schema	£86.00 b
Pipedream 4	£169.00 c
Multistore V II	£169.00 c
Graphbox Professional	£106.00 b
Compression	£37.50 a
Air Supremacy	£17.75 a
Bambuzle	£17.00 a
Bubble Fair	£12.50 a
Cartoon Line	£19.00 a
Cataclysm	£17.50 a
Chocks Away Compendium	£25.50 a
Chuck Rock	£17.50 a
Chess 3D	£12.50 a
Enter the Realm	£17.50 a
Grievous Bodily 'ARM	£17.50 a
Holed Out Compendium	£16.50 a
James Pond	£18.00 a
Lemmings	£17.50 a
Loopz	£17.50 a
Manchester United Europe	£17.50 a
Microdrive World Edition	£23.50 a
Mig 29 Super Fulcrum	£30.50 a
Pandora's Box	£17.50 a
Poizone	£13.50 a
Provocator	£13.50 a
Saloon Cars	£16.50 a
Top Banana	£17.25 a
Wonderland	£22.50 a

Bulk 3.5" Discs available from Stock
DSDD (800K when formatted) for all Archimedes models
50 £20.00 (a) 100 £38.00 (a) 200 £75.00 (b)
High Density (1.6Mb when formatted) for A5000
50 £40.00 (a) 100 £75.00 (a) 200 £145.00 (c)

Memory Upgrades

2nd Mb for A3000 (upgradable)	£51.00 a
4th Mb for A3000 (Atomwide)	£153.00 c
RAM for A410/1 A420/1 (per Mb)	£32.00 a
A5000 2Mb (upgrade to 4Mb) (Atomwide)	£105.00 c
Upgrades	
FAX-Pack (Computer concepts)	£260.00 d
VIDC Enhancer (Atomwide)	£23.00 a
MEMC1a	£45.00 a
ARM-3 (Aleph-One – the best!)	£195.00 c
Ifel Backplane for 310 (with fan)	£57.00 b
Ifel Backplane for 310 (NO fan)	£47.00 b
Vidi-Archimedes	£135.00 c
Clares Micro Mouse	£25.00 a
Armadeus sound sampler board	£127.00 c
Drives	
Floppy disc buffer for A3000	£27.25 a
Floppy disc buffer for 310 & 4xx/1	£27.25 a
Drive mounting bracket for 400 410/1 310	£11.00 a
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Syquest 42Mb Removable Inc. disc case & PSU	£450.00 d
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Cumana 52Mb SCSI External	£419.00 d
Cumana 105Mb SCSI Internal	£365.00 d
Cumana 105Mb SCSI External	£550.00 d
SCSI cards	From £125.00 c
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Scanlight Junior	£121.00 c
Scanlight 256	£193.00 c
Scanlight A4 with Sheet Feeder	£360.00 d
Scanlight Professional - NO card	£820.00 e
Scanlight Prof. with SCSI Card	£920.00 e
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Hewlett Packard DeskJet 500	£299.00 d
HP DeskJet Cartridges	3 for £37.50 a
HP DeskJet 500C (Colour at 300 dpi)	£499.00 d
Laser Direct - Qume	£699.00 e
Laser Direct Hi-Res 4	£899.00 e
Laser Direct Hi-Res card only for LBP4	£294.00 c
Citizen 120 D	£99.50 e
Seikosha SP2400	£135.00 d
Printer Cables 1.8m	£9.50 a

A310/A305 UPGRADES

RAM expansion

2Mb £99

4Mb £163

The 2Mb board may be upgraded to 4Mb later. **Educational and quantity discounts are available.**

- 4-layer board gives low electrical noise and trouble-free operation.
- 8-chip design ensures low power dissipation.
- Compatible with **all** ARM3s, hard discs, backplanes etc.
- Established reliability record. We have been upgrading A310 computers for over two years, and in that time none of the RAM boards which we have fitted has developed a fault and needed repair. **Money back guarantee.**

"We have had a lot of very positive feedback about the IFEL memory upgrades. Archive.

April Special Offers

Claim any of the items below at the reduced price with your RAM upgrade.

Impression 2
£125 (RRP - £169)

IFEL 4-slot 4-layer backplane with fan
£50 (RRP - £57)

RISC-OS Carrier board for larger OS ROMs
£17 (RRP - £21)

ARM3 processor
£189 (RRP - £199)

See our other advert in this issue for A3000 and A5000 hardware and upgrades.

Prices exclude VAT

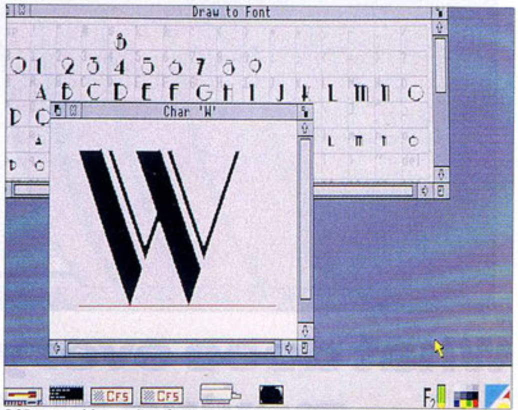
VISA

Further information and price list from;

IFEL, 36 Upland Drive, Derriford, Plymouth PL6 6BD.
Tel (0752) 847286. Fax 840029

SECOND SPRITE

Converting sprites to draw files provides many advantages. **GRAHAM WALTERS** looks at a new package to help you out



D2Font enables outline fonts to be created from draw files

Creating draw files from sprites, and your own outline fonts, are the benefits of a new software packages, called *Trace*. The advantage of converting sprites is that, quite apart from the considerable reduction in file size, draw files can be scaled and manipulated to any size, without any loss of resolution.

DOUBLE ACT

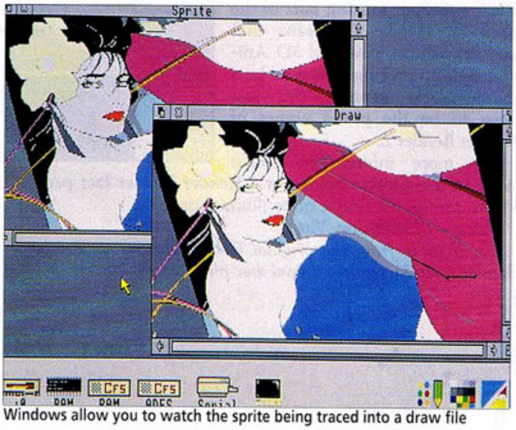
Trace actually includes two applications, *Trace* and *D2Font*. The former does the file conversion, while the latter converts draw files into outline fonts. Clicking select on the *Trace* icon opens the two main windows which, although initially blank, will eventually show the original sprite file and the converted draw file (see the screenshot below).

On the main menu, if a draw file has been created, there is a facility to save it either to disc or directly into another program, otherwise this option is greyed out. It is also possible to save the sprite image itself. To initiate the tracing of the sprite, you use the Trace option and you can watch the draw file being created in the draw window – the pointer becomes an hour glass.

Choices leads to a submenu with two Error and Save options. Error determines how closely the draw file corresponds to the sprite file. A large value will give a poor rendering of the sprite file, whereas if the number is too small, it will reproduce the individual pixels of the sprite. A figure between 0.6 and 0.8 gives good results, although trial and error is required for a specific image. Save lets your current Error value become the default setting.

Info tells you of the mode, number of colours and size of the sprite and draw images. If you have a number of sprites to trace, you can place them in a directory and drop this on to the icon. Another directory called Draw is automatically created and you can then trace each sprite in turn, placing the resulting draw file in this directory. After tracing, a sprite can be loaded into *Draw* for final tweaking, although this was not necessary for most of the sprites I tried.

The type of sprites that *Trace* definitely does not like, are those with any dithering or graduated fills – they generally give very poor results. However, by re-working these areas in *Paint* first, a better result can be achieved.



Windows allow you to watch the sprite being traced into a draw file

OUTLINE FONTS

The second application, *D2Font*, loads itself in the normal way. Clicking on its icon opens a grid window which has a small light grey character in the top left hand corner of each box, to show you where to drop each draw file.

One annoying point was that positions for Ascii code numbers 128 to 159 are shown in the grid as hexadecimal numbers. These characters in your font are accessed by pressing the Alt key and typing the character's Ascii code number, but it would be better if the Ascii code numbers were in decimal. Double clicking Select over one of the character squares brings up a window showing a larger version of that character, complete with a red line underneath. This represents the base line of the character, which can then be resized by using either Select or Adjust.

Normally, you need to make red line slightly larger than the character outline. For characters with tails – such as a lower case p – the red line needs to be moved up to keep all the characters in line.

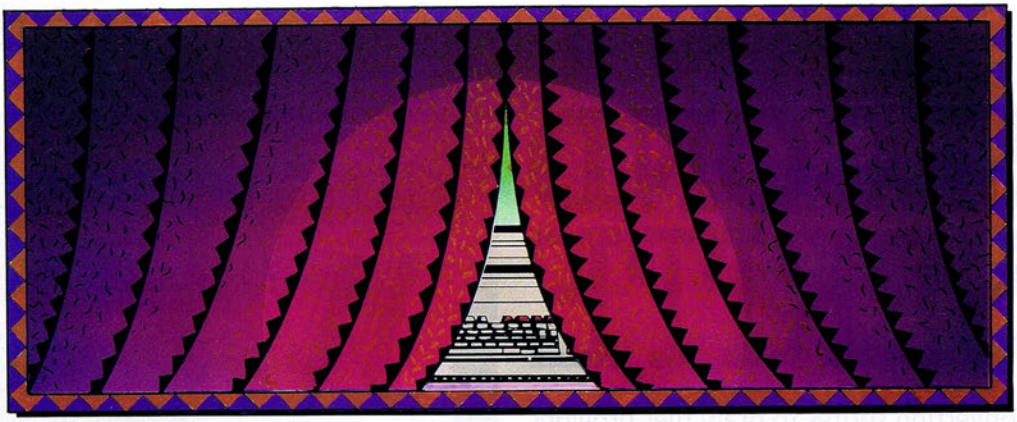
When you have finished compiling your grid, a Save Font option presents a directory icon that contains the Outlines and IntMetrics files. This directory is then copied into your current fonts application. One word or warning. Unlike a normal file, you can't rename a font directory to change the font name, so make sure that the font is saved with the correct name.

CONCLUSION

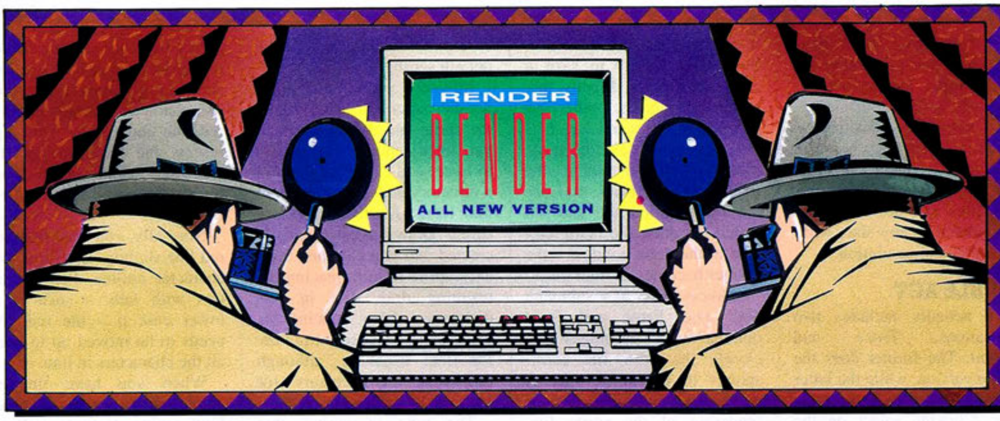
Both *Trace* and *D2Font* are very easy to use and perform their tasks extremely well. Overall, the package represents excellent value for money and is suitable for both school or home users.

PRODUCT DETAILS

Product: Trace
Supplier: David Pilling, PO Box 22, Thornton Cleveleys, Blackpool, FY5 1LR
Price: £5.99
Machines: All Risc OS machines



What does everyone who creates moving pictures want?

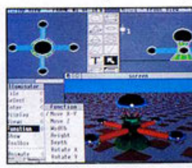


A sneak preview.

Render Bender is the graphics package that allows the user to produce remarkable animated graphic sequences using Ray Tracing.

Ray Tracing isn't nearly as complex as it sounds. Basically, in a ray traced sequence, every pixel on the screen takes all relevant light sources into account. Ensuring that all the reflections and refractions are correctly calculated even if the light is reflected off several surfaces. The image could be no more faithful if you were filming real objects in real light. To produce such a superb animated sequence, however, was quite a difficult task – Until now.

Illuminator has changed all that. It is a fully RISC OS graphical front end to Render Bender. Allowing the user to create a series of frames manually, or to give it a start point and an end point, leaving it to generate the frames in between. What you are getting is the ability to take a sneak preview. You can see what you are going to get, before you get it. After you've created your outline frames in Illuminator, you then transfer the files to Render Bender, the fully RISC OS Ray Tracing part of the package. Which all means that now, to achieve powerful 3D Animation, you no longer have to be a mathematical genius. You just have to be the proud owner of Render Bender 2.



For more information please write to the address below for a Render Bender fact pack. We're sure you'll find it quite illuminating.

Price – £135.00 inc. Vat.

To upgrade from the original Render Bender to Render Bender 2 send us your original disc plus £74.95.

10 Years of Excellence

CLARES

98 Middlewich Road, Rudheath, Northwich, CHESHIRE CW9 7DA. Telephone: 0606 48511 Fax No: 0606 48512

MEMORY LAPSE

The A310 is sadly lacking in one vital area. MALCOLM BROWN looks at how you can boost its memory space

Regular users of an Archimedes A310, not to mention the A305, will be well aware of the limitations of the memory supplied. For instance, if you load up *Draw* and *Edit* on the icon bar and then draw a reasonably complex figure, suddenly there's no room left to write about it.

The answer is, of course, to add more Ram. The A310 can handle up to 4Mb of Ram without flinching and several manufacturers have come up with upgrades which allow you to increase the power of the A310 considerably.

There are two sizes of Ram board commonly available – 2Mb and 4Mb. Bear in mind however that these sizes refer to the total Ram in your machine *after* fitting, rather than the amount of extra Ram.

The 2Mb upgrades use the existing Ram in your Arc. (If you have an A305 you may have to upgrade to 1Mb before fitting.) The 4Mb upgrades, on the other hand, add 4Mb of Ram to your machine, and the existing on-board Ram becomes redundant.

Since Ram is relatively low-priced, it makes sense to go straight for the 4Mb and this is the type we have chosen to look at in more detail. It's also a good idea to fit a Memc1a upgrade (a memory control chip) while you're at it. Incidentally, if you believe that one day you might want an Arm3 in your Arc, bear in mind that some Ram upgrades limit your Arm3 choice. It is worthwhile checking with the manufacturers first.

The 4Mb upgrades fall into two categories – those you can fit yourself, as they can be simply plugged in, and those which you are advised to have fitted by an expert, since they require some delicate wiring and soldering.

PLUG IN

With this type of upgrade (see our Watford and Ground Control boxes), fitting is simply a matter of removing the Memc and Arm chips, and fitting them into the sockets on the new board, then fitting the new board into the old sockets.

However, removing the two chips from the main board is not easy, even with the tools supplied from the upgrade manufacturers. You should also remember that these devices are easily damaged by static electricity – walking across a nylon carpet can generate up to 10,000 volts in your body!

WIRED IN

The cheapest option is a directly wired-in solution (see our Atomwide and Ifel boxes). The memory board is plugged into specially installed sockets. These are simple 16 and 18-pin sockets and cost only a few pence but you do have to do a lot more work to connect up to these lines. Many other connections must be made to various parts of the Arc's existing memory and to the Memc chip.

Removing the old memory chips and installing these sockets is not for the faint-hearted or the inexperienced. The upgrades are cheaper but if you do try it yourself, you could make some expensive mistakes: Instead, it is best to leave it to the experts and use the fitting service provided.

CHOOSING A BOARD

For this review we looked at two plug-in boards and two wired-in boards. Unfortunately, the cheapest board around (£155 for 4Mb) from Simtec, (0772) 812863, was undergoing a design revision at the time of the test and so could not be included.

When making a decision, the first choice is whether you can bear to be without your beloved Arc for a day or so. If the answer is no, then self-fitting is the only option and you should go for Ground Control or Watford because of their installation simplicity. Of these two, the Watford board must win out because it is a four-layer construction, but I would like to have seen some additional insulation .

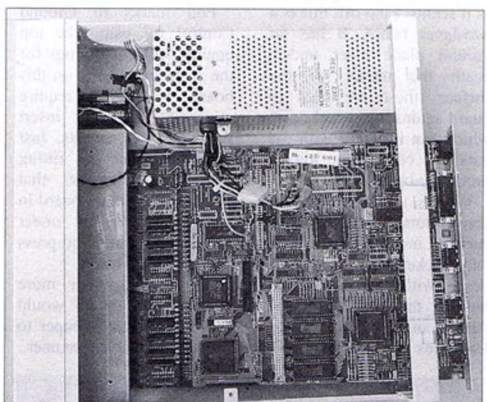
The cheaper option, and perhaps the better one in terms of compatibility with further upgrades, and the likelihood of it staying put in your machine, is a hard-wired board. Ifel and Atomwide produce hard-wired boards and there is little to choose between them, since they are both both well designed and well made.

ATOMWIDE

Price: £199
This includes a fitting service, courier service and a Memc1a
Tel: (0689) 838852

This board is certainly not one to be fitted at home. Atomwide provides a collection and delivery service, as well as fitting – which just as well, this board is even more tricky to fit than Ifel's – 24 fiddly resistors need to be soldered into place. It looks extremely similar to the Ifel model and fits into the same installed sockets.

The Atomwide upgrade does have slightly fewer chips, but this is not really apparent to the end-user. This is a four-layered circuit board so there should be no line noise problems, even when the machine is subjected to the hardest working conditions.



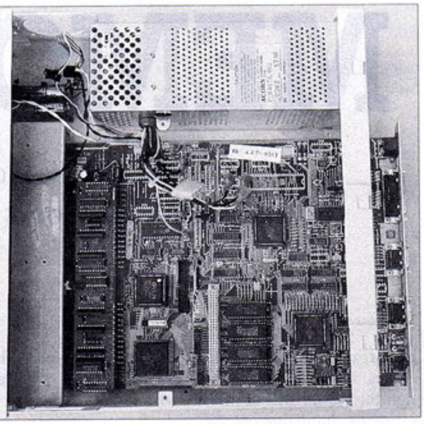
IFEL

Price: £219
This includes a fitting service, and overnight courier service, plus an Memc1a, and Rom upgrade board
Self fitting price: £199 (with Memc1a) or £163 (without Memc1a)
Tel: (0752) 847286

This is really a dealer-fit upgrade. Although Ifel welcome DIY fitting and the upgrade can be supplied with some excellent DIY instructions, only the extremely adept should attempt to fit this board at home. The Ram board is quite small, without the need for Arm and Memc sockets. (It also provides enlarged sockets for Risc OS 3 chips, in anticipation of a possible plug-in upgrade).

As well as connection via the installed sockets, three wires connect to address lines on the Memc socket underneath the board. The whole main circuit board needs to be be completely removed in order to fit this upgrade.

The Ifel Board is four-layered and is well made. It is a neat and long lasting memory upgrade.



GROUND CONTROL

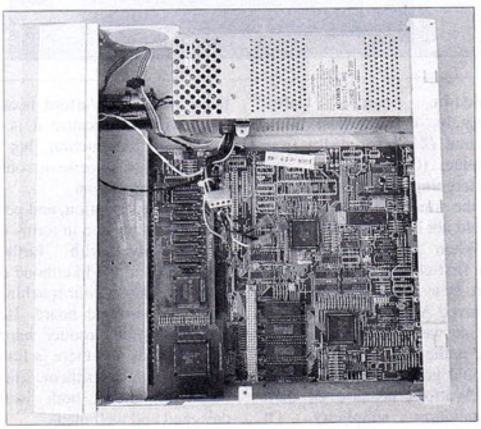
Self-fitting board
Price: £243
Tel: (0635) 524008

This board is of the easy, self-fit kind. At first glance it looks extremely neat and compact. However, all is not as it seems. First off, this is a two-layer board. It has no ground plane layer underneath the tracks on the surface: these are used to guard against electrical noise which can interfere with the data and corrupt the microprocessor operation.

What's more, the use of conventional (rather than surface mount) chip plugs and sockets has created a design with small sub-boards holding the sockets for the Arm and Memc. This lengthens the tracks at risk from noise. Also, one logic chip on the board has several unterminated inputs – again bad design practice. However, it must be said that we found no problems of noise during the review and such troubles would usually only show up in a heavily loaded Arc.

Full marks to Ground Control for using the top quality McKenzie plugs for the Arm and Memc on this board. These require minimum force to insert them into the sockets. Just as well, since the fitting instructions suggest that you leave the main board in place, so it is put under some strain when you press home the new board.

All in all, rather more attention to detail would make this board cheaper to produce and a clear winner.



WATFORD ELECTRONICS

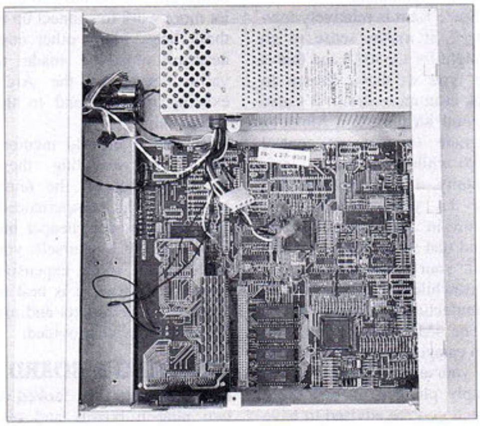
Self-fitting board
Price: £265
Tel: (0923) 237774

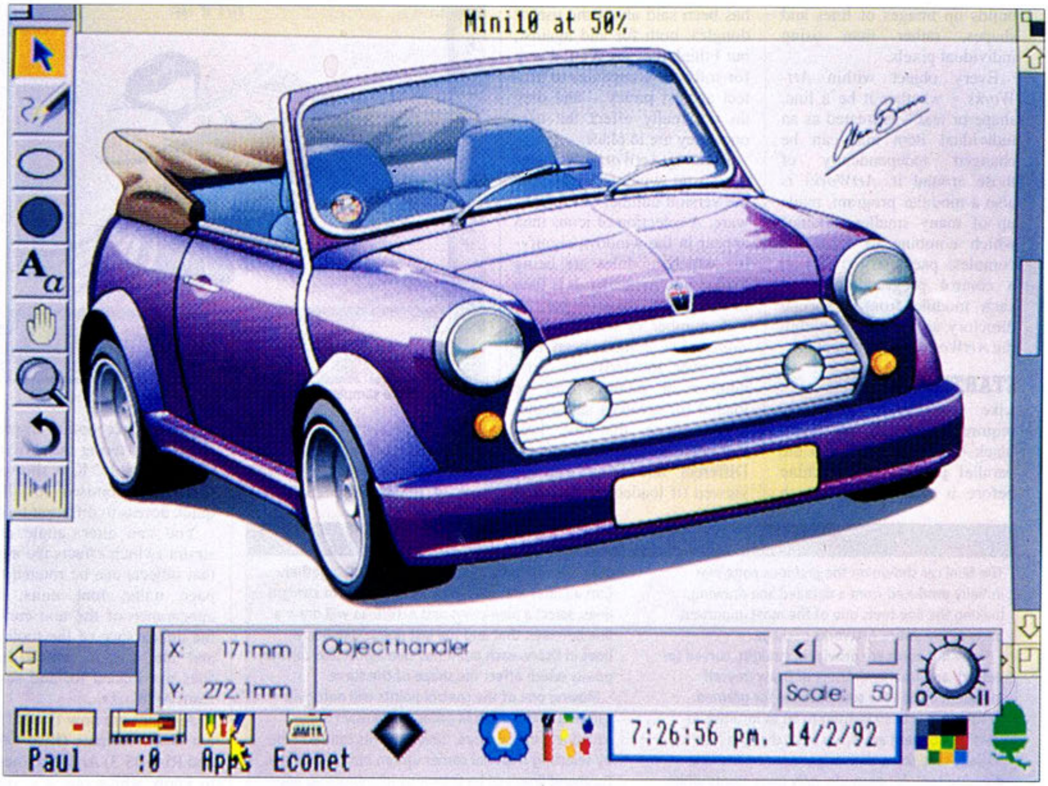
Another self-fit board, this upgrade is thoughtfully supplied with a chip removal tool for the Arm and Memc. However, this is not neccesary, since a small screwdriver works much better. Also provided is a new floppy drive cable – the Ram board gets in the way and a longer cable is needed to snake around it.

Once the Arm and Memc chips are removed, the upgrade board is plugged into the empty sockets on the motherboard. A second board then slots into place and is used to hold the relocated Arm processor. So to upgrade to an Arm3 simply involves unplugging this second board.

Again the instructions say to leave the main board in place during the installation. Given Watford's choice of low-cost plugs, more pressure was required to fit the upgrade to the main board, putting it under some strain.

The smaller board fits up against the metal side of the Arc and is insulated with only a sheet of clear plastic. This could easily be pierced by a pin causing a short circuit and on the review sample, this had already happened. However, the upgrade is otherwise well-made. It is a four layer board (although the sub-board is only two-layer) and, if you add a bit more protection to the smaller board, it is an excellent design.





WORK OF ART

Is this the moment that designers have been waiting for?
ROB MILLER looks at the release of ArtWorks

Computer Concepts is a company renowned for its high quality software. One case in point is its desktop publishing package *Impression 2*, which is used to produce *BBC Acorn User*.

So the announcement of *ArtWorks*, CC's new design package, has been causing something of a stir among BBC A3000 and Archimedes users. Will the new package do for design what *Impression* has done for DTP? We were invited by Computer Concepts to have an exclusive preview of the new *ArtWorks* package.



ArtWorks is best described as a high-quality design package and was used to create all of the images shown here, including the very impressive picture of a Mini, shown above.

The package is designed to be easy to use, yet is also sophisticated enough for the professional user. So what is *ArtWorks* capable of?

OBJECT-BASED

Firstly, *ArtWorks* is *not* a painting package. Although it is used to produce pictures, it is an object-based program (in the same way as *Draw*) and

builds up images of lines and shapes, rather than using individual pixels.

Every object within *ArtWorks* – whether it be a line, shape or text – is treated as an individual item and can be changed independently of those around it. *ArtWorks* is also a modular program, made up of many smaller modules which combine to form the complete package. When run, a control program loads in each module from a special directory and installs it within the *ArtWorks* environment.

STARTING UP

Like *Impression*, *ArtWorks* requires a dongle (a small black box) to be fitted to the parallel port of the machine before it will operate. Much has been said about the use of dongles, both for and against, but I think they are a good way for software companies to protect against piracy – and they do not really effect the user once they are in place.

Running *ArtWorks* produces a start-up window displaying the version number of the software. A selection of icons then appear in the window, signifying which modules are being loaded into *Artworks*. It is then installed on to the icon bar.

A number of features from *Impression 2* have been carried over to *ArtWorks*. Any number of pictures can be loaded (or created) simultaneously, given that the host computer has enough memory. Different documents can be viewed (if loaded) or removed



Just one of the samples from the ArtWorks gallery

from *ArtWorks* as normal. Also, different preferences can be set up that affect the overall use of the package. Selecting the preference option displays a menu covering the different tools available. Key shortcuts can be customised to allow quick access to different tools.

You can alter: angle constraint (which effects the angle that objects can be rotated to); page units; font units; the appearance of the text cursor; the appearance of the toolbox, and the way in which draw files are loaded to, and saved from *ArtWorks*.

As there are now two different *Draw* formats (Risc OS 2 and Risc 0S 3) *ArtWorks* needs to know which one it is dealing with. There are also some features in *ArtWorks* which cannot be shown directly in *Draw* – graded fills for example – so there is also an option to set the quality level in a picture when converting from one program to the other.

RUNNING ARTWORKS

Clicking on the *ArtWorks* icon produces a blank window and clicking on this brings up two other windows – the toolbox and the info bar.

Both windows are panes, meaning that they are actually a part of the main window and move about whenever the main window is repositioned. This option can be changed in the preference menu.

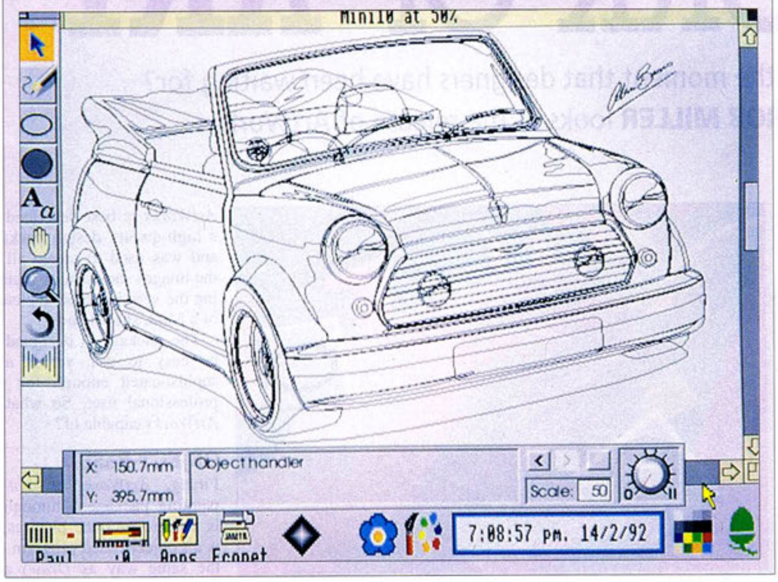
In keeping with the modular nature of *ArtWorks*, tools are organised into obvious groups in the toolbox window. Tools of a similar nature that are not shown on the toolbox can be accessed by clicking Menu, as you would with a conventional Risc OS menu. The toolbox itself is editable: tools can be rearranged, removed or added

HOW TO DRAW THE LINE

The Mini car shown on the previous page was initially produced from a detailed line drawing, making the line tools one of the most important parts of the entire ArtWorks package.

Three line tools are provided; straight, curved (or bezier), and freehand. Users of Draw (myself included) often take some actions for granted. ArtWorks has been written to be as intuitive as possible so there are a few basic changes that can initially take some time to get used to.The Line drawing tool, for example, only joins points when you click on a new point. There is no continuous 'rubber-banding' as in Draw, although lines can be dragged around by holding down the select button on the mouse whilst drawing. Filled objects can be created by just dragging the start point of a line over the end point whereby they 'snap' together. Curved lines are created in a similar way to straight lines; select a new point and ArtWorks will draw a line between that and the last point. Like Bezier lines in Draw, each point has two associated control points which effect the shape of the curve.

Moving one of the control points will automatically move the other in order to maintain the roundness of the curve. 'Sharp' points can be made by selecting a special corner option on the Info box. Freehand lines can be drawn by just doodling with the mouse as you would in a normal painting package. Artworks will then take the squiggle and attempt to fit a curve along it. The level of accuracy can be set with a slider control and the results are impressive, especially with a fast Arm3 machine.



to customise it to the user's requirements. You can drag tools from the sub-toolbox to the main one, but dragging tools from the latter removes them and places them in the appropriate sub-toolbox.

The info bar plays a less active role. It displays a constant readout of the mouse position (in millimetres) and also the scale of the current drawing, easily altered by typing in a new percentage. However, two of *ArtWorks*' most useful features are controlled from the info bar – the undo/redo feature and the Wysiwyg (what you see is what you get) control.

Any operation can be undone by clicking on the left arrow or redone with the right arrow, and it is even possible to perform multiple undos to take a drawing back to the beginning. The undo list is saved with its associated drawing, as part of an *ArtWorks* file, and will record all actions required to create that particular illustration. But you cannot rely on it completely: there are cases when it is impossible to redo an undo, such as when deleting a complex object. A warning will be issued if you attempt such an action.

The Wysiwyg control knob allows the level of rendering in a picture to be set from simple outlines to fully shaded objects. The dial runs from one to 11, one being outlines and 10 being fully filled in objects. When set on 11, all lines are anti-aliased, producing a very clear display in any 256-colour mode, particularly when using a multiscan monitor. Generally, the picture quality, even in 16 colour modes, is excellent, especially if the primary palette feature is selected. This sets the desktop palette so that a full colour spectrum can be displayed using dithering.

Panning or scaling the main window can take some time, especially if you are working on a complex drawing, so a special button on the info bar allows you to update the picture in the background.

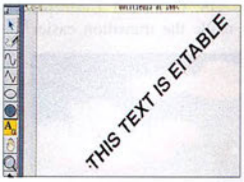
IMAGE CREATION

So, how do you go about creating an image with *ArtWorks*? Well, as we said earlier, this is an object-based application, and there are only two basic objects in *ArtWorks* – lines and shapes. A line is just like a path in *Draw* and consists of a number of points with a start and end, while a shape is any line that has its start and end points joined together.

Pictures can then be built up by drawing lines and shapes of any colour together and then editing each object until you like the results. The tools used to build up a picture can be split into two categories – those that create objects, and those that change or manipulate objects in some way. These tools deal with different aspects, including lines, shape colours, and other useful features, such as zoom.

TEXT

All text is stored in modular form, in keeping with the rest of *ArtWorks* and is regarded by the program as a shape (or shapes). This means that text can be typed in, rotated, shaded and can still be edited at all times. A new FontManager is provided with *ArtWorks* to allow rotated text, even in Risc OS 2. Text files can also be loaded in and edited, even after rotation and filling.



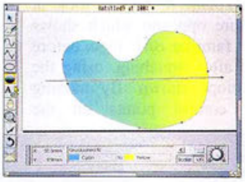
Although not available as yet, it will also be possible to have text squashed into envelopes (see section on moving) and still be able to edit it.

The caret will even change shape according its whereabouts on a line.

SHAPES AND FILLS

Three shape tools give ellipses, rectangles and rectangles with curved corners. All three tools can be 'restrained' (by holding down the CTRL key on the keyboard) to produce regular shapes, such as circles, squares and rounded squares. The CTRL key is also used when another sort of 'locking' action is required: namely scaling and rotation.

But one of the most impressive features of *ArtWorks* is the graduated fill. In *Draw*, if you wish to 'shade' objects, a number of multiple objects have to be overlapped and coloured to fit the required scale. While *Draw* lets you do this automatically in Risc OS 3 the resulting file is large and awkward to edit. In *ArtWorks*,



however, you merely specify a start and end point, and the two colours to fill between, and – hey presto – there it is (see picture above).

Fills are stored as just those items, thus saving a great deal of memory. Another advantage of *ArtWorks* is that they are shown as one smooth graduation, using *ArtWorks'* own special dithering routine.

COLOUR

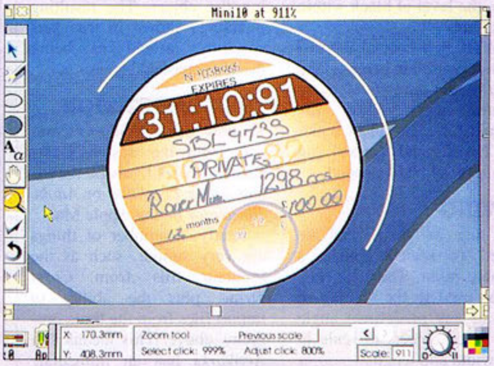
Because *ArtWorks* is a 24-bit, full-colour illustration tool, likely to be used up to professional level, a lot of care has gone into colour selection and the provision of a wide range of colours (shown left). Selecting colours for filling is simple and is done in much the same way as selecting styles in *Impression 2*. A basic list of shades is always available – eight greys and eight colours.

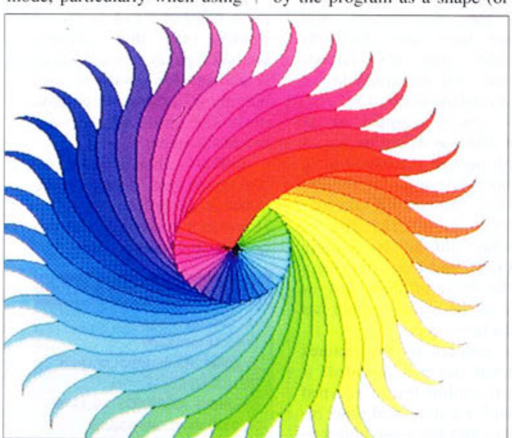
The list can be added to by selecting a current colour and altering it using one of three techniques; RGB, HSV and CMYK. RGB (red, green and

ZOOMING IN

One of the most impressive ArtWork tools is the magnifying glass used to zoom into the entire picture or selected parts of a picture.

Here we have zoomed in on the tax disc of our original Mini (which just happens to be out of date – tut, tut!)





The colour range is an important part of the ArtWorks program

blue) is the method used in the Risc OS palette utility. HSV is hue, saturation and value, hue being the general colour from the spectrum, saturation the strength of the colour and value the level of black within the colour.

CMYK is a special method commonly used in printing and refers to the amount of cyan, magenta and yellow ink required for each dot in a picture. The K stands for key and is the level of black needed.

MOVING

Any line or shape can be rotated or scaled around a movable point. The CTRL key can be used to fix rotation to steps of any predefined angle or to force objects to scale in both width and length.

Those who have used programs such as *DrawBender* and *BBC Acorn User's* very own *Stretch* program, will be familiar with the effects of the envelope tool. Rather than try to explain it, take a look at picture opposite which shows our familiar *BAU* logo, before and after stretching, using the envelope shown. By moving the control points on the envelope, any object within it can be stretched or squashed.

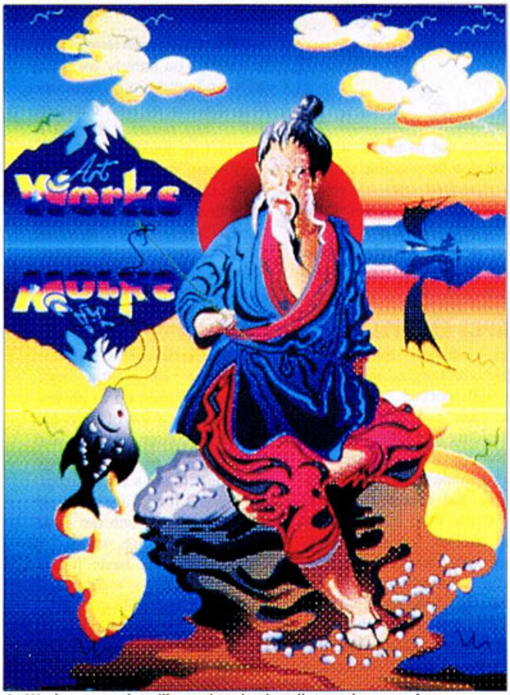
The perspective tool can also alter the shape of an object by dragging the points on to a quadrilateral, surrounding the object. The resulting picture is shown in true perspective, instead of being merely squashed.

THE COMPETITION

So how does *ArtWorks* compare with the design giants such as *Corel Draw* on the PC and *Aldus Freehand* or *Adobe Illustrator* on the Apple Mac.

Firstly, a number of things are very similar, such as the fountain fills from *Corel Draw*, plus the ability to import files from the three programs above. This means that *ArtWorks* has an immediate picture library. Loading a *Corel Draw* file is just a case of using a PC disc reader (already present in the new A5000) and dragging it in.

Users of illustration programs on the PC and Mac should have no trouble getting to grips with *ArtWorks* – once they become familiar with Risc OS. Computer Concepts has made the transition easier



ArtWorks can produce illustrations in virtually any chosen style



The envelope tool allows for some highly versatile shaping

by including a utility, *FlipTop*, which allows you to change mode by just selecting the resolution and number of colours needed.

Where *ArtWorks* goes further is in its capacity to exploit the advanced features of the Archimedes, which makes it incredibly fast to use. Timings made, comparing programs such as *Corel Draw* running on 486-based PCs with *ArtWorks* running on an Arc with an Arm3 processor, showed that a typical redraw speed was up to five times faster with *ArtWorks*.

THE FUTURE

Because *ArtWorks* is modular in design, tools can be removed or added to the program. This means that in the future, it will only be necessary to add or replace existing modules if you want an updated version of *ArtWorks*.

Computer Concepts is hoping that third-parties will design their own *ArtWorks* modules and a reference manual will be available for those wishing to do so.

A typical example of an later addition would be, say, a graph module that could then, in turn, make use of *ArtWorks'* existing fountain fill and perspective tools. The list of possible add-ons is virtually unlimited and I can imagine a whole flood of them just as soon as the main program has sold a few copies.

In addition to the features outlined (no pun intended) it will also allow text to be typed around a curve, real-time in-betweening from one object to another, a grid facility for accurate drawing and smart-duplicate feature to allow repeated patterns to be created simply.

CONCLUSION

Although they both operate as object orientated graphics packages, comparing *ArtWorks* with *Draw* is rather like comparing *Impression* with *View* (on the BBC Master). Both do basically the same thing, but the former application is the only choice if you want high-quality output.

Many effects that would take a long time to produce in *Draw* can be achieved in seconds with *ArtWorks*. The overall speed and friendliness of *ArtWorks* makes it possible to experiment with ideas, thus aiding productivity. Given time, patience and a little bit of artistic skill, the results can be astounding, as some of the examples here demonstrate.

With the addition of Computer Concept's Colour Direct printer (see this month's Graphics page) it forms what is perhaps the easiest to use, but most advanced graphic illustration package, on any personal computer today.

ArtWorks should be out by late spring and, despite being aimed at the professional user, I can see it becoming as popular as *Impression* is today.

PRODUCT DETAILS

Product: ArtWorks
Price: Under £200
Suppliers: Computer Concepts
Tel: (0442) 63933
Machines: All Risc OS machines
Release date: Late spring

IFEL

36 Upland Drive, Derriford, Plymouth PL6 6BD
Tel (0752) 847286. Fax 840029

A5000 £1499

Acorn's new machine with RISC OS 3, multisync monitor, ARM3, and 40Mb drive. *An extra 2Mb of RAM (4Mb total) is included free.*

A5000 learning Curve - £1531. (£1798.92 inc. VAT)

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Upgrades your 2Mb A5000 to 4Mb. High quality 4-layer board as recommended by Acorn. Fitting does not involve any soldering. **Extra 2Mb (4Mb total) £99.**
N.B. This upgrade is currently supplied free of charge with both of the A5000 systems above (ie standard version and the Learning Curve).

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- **4Mb - £148.95 2Mb - £55 Bare board - £25.50**

A310 RAM

8-chip design ensures low power consumption. Compatible with ARM3 upgrades, backplanes, hard discs etc. Larger OS ROM option. Four-layer circuitry reduces electrical noise for trouble-free operation. The 2Mb board may be upgraded to 4Mb later. **We offer a no quibble money back guarantee on this product.**

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New shop opening at 44 Crwys Road, Cardiff on March 16th 1992.

PINEAPPLE SOFTWARE

The Pineapple Colour Video Digitiser Big Price Reductions ! ! !

Since we originally introduced the Pineapple Video Digitiser almost two years ago we have not needed to modify the design of the hardware in any respects,. However, the software has been continually improved to the point where the quality and quantity of software supplied is second to none.

Now, because of the large number of sales, we are able to offer a big price reduction which makes colour digitising available to everybody. Also, because we are so confident that you will find the Pineapple Digitiser superior to anything else available, we are happy to offer our Digitisers on 7 days free approval so that you can see for yourself the power of our software.

Some of the features of the Pineapple Digitiser, many of which are still exclusive are as follows:–

- 16 bit true R G B storage in 256k ram.
- Sequences of frames of a moving picture can be grabbed and stored in memory. Up to 30 frames in a 1mb computer, 200 – 300 frames in larger computers!!
- Full screen area normally viewed on a TV set is grabbed in full.
- Images may be processed using our own high speed software routines or Acorn's Change FSI software.
- Quite simply the most powerful and easily used zooming and cropping routines available with any processing package.
- Two independant multitasking applications supplied. Non-multitasking software allows digitising without windows for adding still images to videos.
- Our hardware does not use interupts so other applications run at full speed.
- Latest software includes built-in print routines. (Existing owners please contact us for a free update).
- Hard locking synchronising circuits for best results from video recordings.
- Available in a stand alone box for use with A3000. In this mode it can also be used with 300/400/500 series computers only occupying one expansion slot.
- Free seven day trial.

A300/400/500 £199.00
A3000/Boxed £235.00

Pineapple PAL Coder

The Pineapple PAL Coder is a stand alone unit which provides a coded video signal which can be recorded onto a VHS recorder or fed to a monitor with coded input.

The unit is inserted in the lead to the R G B monitor and provides an R G B output for the monitor together with a full specification PAL coded output. A second version provides a standard coded output but also provides an S–VHS output for improved quality recordings on S–VHS recorders.

Features:–

- External to computer – no expansion slots used.
- Complete sync pulse regeneration providing a full CCIR sync waveform for best results on VHS recorders.
- Selectable to work with 625 interlaced screen modes or 624 line non-interlaced modes.

Standard Version £69.00
S–VHS Version £79.00

BBC PCB Designer

This ever popular Rom based PCB designer is suitable for all BBC micros, It's fast high density 1:1 scale print routine allows prototype boards to be made directly from a printout, and a 2:1 scale print may also be used to produce professional quality boards. A second Eprom is optionally available to add a powerful auto-track routing facility to the program,. This utilises a 'rats nest' input routine and allows any component to be 'picked-up' and moved around the board without having to re-specify component interconnections.

The full auto-route facilities are available even on an un-expanded model 'B' computer. An Archimedes version is available as a free upgrade to existing BBC owners or at a similar price to the BBC version.

'PCB Auto-route is remarkable. No similar software comes near the price'
Acorn User – August 88

Manual track routing £55.00
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Making backups doesn't have to be a tiresome chore. **GRAHAM BELL** looks at a simple solution

GETTING YOUR BACK UP

The essential problem with backup software is that it is less entertaining than playing games – so playing a game always seems a better way to spend that spare hour. Even the tiniest nuisance factor in the program will seem like a major fault. And, unless you make backing-up part of your daily or weekly routine, then it will probably never get done.

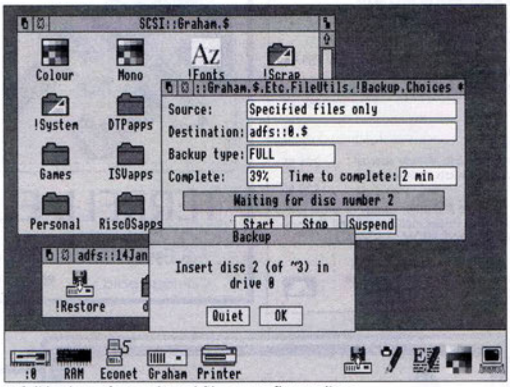
Beebug's *Hard Disc Companion* aims to make the process more palatable and version two improves on and tidies up on a lot of the loose ends in version one.

Backup is the usual icon bar application. It opens a simple dialogue showing the current choices: the main directory to backup, the place to back it up to and so on. A menu allows you to choose between a full backup, or two types of partial backup. A differential backup is every file that has been changed since the last full backup, whereas the incremental type is everything since the last backup.

WAYS AND MEANS

The best way to use this system is to do full backups regularly and then do differential backups every day. That way, two sets of discs are all that is ever needed to restore your work.

Specifying the backup destination is a simple matter of dragging a directory icon to wherever you want to put your archive (on another hard disc, say). Or you can choose the default, ADFS::0.$, to put it all on floppies. In contrast, choosing which source to back up is completely counter-intuitive: you drag an icon from the Backup window into the directory you want to back up, rather than dragging the directories into the Backup window. However, there is a flexible way of choosing individual directories and files to back up by dragging them into a window, and a way of excluding files and directories by name or even by filetype.



A full backup of pre-selected files on to floppy discs

Once you have chosen your source and destination, you can save your choices as a sort of script file – double-clicking on that file in future will repeat the same backup procedure. This is good for formalising the full/differential routine: you could keep two script files called Day and Week.

As the archive is created, it prompts for new floppies to be inserted and it names the discs in numerical order, formatting them as well, if necessary. It's reliable and you can pause at any time to do something else, or even carry on typing in a wordprocessor – it works pretty much in the background. There's no problem with long files: they are compressed and, if they are still too long to fit on a single disc, they are split. Compression is much improved: version one contained a short list of filetypes which it would compress, and few people bothered to add to the list. Version two tries to compress almost everything except very short files. And you can tune it (by editing the Messages file) to try harder if you have an Arm3.

How much compression is achieved varies immensely: a typical mix of data files compressed to about 55 percent of its original size, but a 2.5Mb Impression document with lots of sprites reduces to 13 percent. Despite the compression, be ready with about 80 floppies to fully back up your 100Mb hard disc, and put aside a couple of hours.

The archives that Backup version two creates are self-extracting to an extent – it puts Restore and Retrieve applications into the archive, along with the data, so you can always get your stuff back, even if your only copy of Restore was on your crashed hard disc. Unlike version one, Restore can only be used to get back the entire collection of files. Retrieve is the new application to get back selected files – but you have to remember the filenames. There's a wildcard search for filenames in an archive, but if you have to browse, you too often get the error 'window full' when you can't quite remember enough of the name. Also you cannot search for a file of a particular type.

If you do find the file, then you just drag it out to retrieve it, but it would be better if Retrieve showed a tree view of the files and directories in the archive and allowed you to select both individual files and whole branches of the tree, like the old Mitre *Disctree*.

It is also worth noting that some applications, notably Beebug's own *Ovation*, cannot be run from a restored copy.

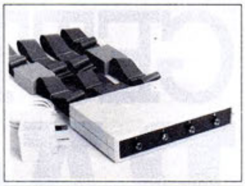
CONCLUSION

Overall, *Hard Disc Companion* is a good but not a great backup system. It's convenient to use, with fewer rough edges than version one, better treatment of new filing systems and better compression: a worthwhile upgrade. Unlike *Spark*, it splits long archives over several discs, it's faster and it compresses practically as well. But it still isn't perfect, particularly for network fileservers, where a tape system is better.

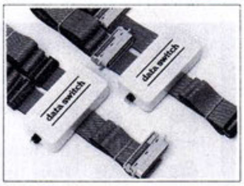
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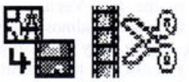




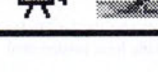


Ace Computing









ACTION REPLAY

PAUL JAMES examines the new full motion video system from Acorn

The *Hitchhikers Guide to the Galaxy*, that renowned book, radio and television series, provides what is probably the most famous example of where multimedia could go in the future.

It featured a hand-held computer which knew absolutely *everything* about the universe and was frequently consulted by Ford Prefect on his travels through space and time. Ford would ask the computer a question and the little electronic book would launch into a narrated, animated sequence, to throw light on to the subject in question.

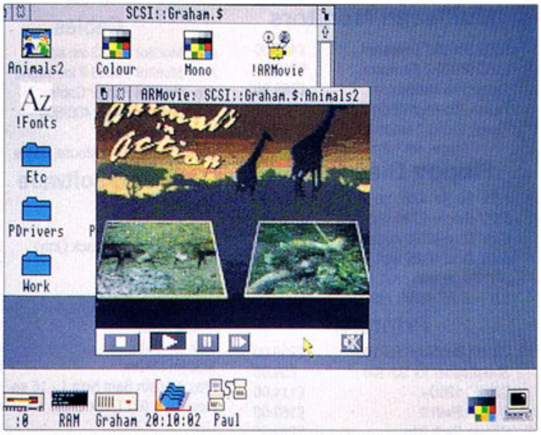
Today, the race is on in the computer world to turn massed information into a kind of 'virtual reality', with particular emphasis on moving video images. Now Acorn has joined the fray with its new full motion video system – Acorn *Replay*. Aimed primarily at developers, it will undoubtedly hasten the impact of multimedia in the Acorn market.

DATA HANDLING

Until now the major hurdle when using motion video has been the sheer size of the files involved. It is not just a case of saving one image, but a whole sequence. The storage and loading of such sequences are the biggest problems, but *Replay* tackles both by using existing hardware and some very clever software.

CD-Rom systems can store large amounts of data. Just one plastic compact disc can hold around 96,000 pages of text – and that's before compression, which can in some cases, reduce the size of a chunk of data by 20 times or more.

An increasing amount of data is being transferred on to CD-Rom format. Encyclopedias, newspapers, reference manuals and books (including the Bible) are now being turned into data which can be read by the computer, decompressed and finally shown on the screen.



Acorn Replay – full-motion video capability on the Archimedes

But until recently, CD-Rom players have not been able to produce moving picture sequences on the computer screen because of their inherent slowness. A decent-sized picture – say, a quarter of a mode 15 screen – consists of around 40Kb of data. To get the 12.5 fps (frames per second) needed to fool the human eye into seeing a fairly smooth-running image, the computer needs to suck about 4,096,000 ones and zeros from the player per second. With current mainstream hardware, that is just not possible.

However, if each video frame is compressed, then it is possible to get 12.5 frames of data per second from a CD (25fps from a quicker device, such as a hard disc). The computer then has to decompress this data and place it on to the screen – no mean feat.

This is what Acorn *Replay* achieves. With a standard hardware device (either a CD-Rom or a hard disc) containing the movie file, the decompression and display can be handled by the *Replay* software. The fact that no special hardware is needed is what makes *Replay* so cost effective, compared with other hardware-based solutions.

The compression techniques are the key to the *Replay* system, (see box) making it possible to fit a 12sec, 12.5fps film on to a single floppy disc. Acorn has also thrown in multiple channel, stereo sound.

CONCLUSION

Acorn Replay opens up new multimedia options. Moving pictures are instantly impressive and guaranteed to grab attention. Used in the right circumstances, they are far more informative than text, one example being a short movie showing how to operate a piece of equipment. An A5000 with a built-in video tutor? Well, memory would be a problem, but it is possible.

Although *Replay* is not aimed at individuals (the Archimedes system needed to make the sequences has to be powerful and requires expensive additional hardware), it is sure to be picked up by software developers who, by incorporating the compression and decompression facilities, will be able to include moving pictures in their own packages.

Support for *Replay* has already been included in the *Magpie* and *Genesis* multimedia packages. Before long, we could see many applications, released on CD-Rom, that include moving pictures.

HOW REPLAY WORKS

Acorn Replay is primarily aimed at software developers. The sequence, in the form of a video or similar media, is passed on to a company who will then master it and put it on to a large storage device, uncompressed. The first part of the Replay software then comes into play.

First, the video data is reduced to Archimedes' sprite format, then each frame is taken in turn and compressed. At this stage, the compression is simply a case of removing data from the image – and it is no loss, since this is data that the human eye is unable to see anyway. Areas which include several, subtly different colours are evened out, and highly detailed areas are smudged. Then a form of Delta compression is used, which relies on the fact that only one part of the picture is moving, while the rest is stationary. As the computer already has the data for the stationary part, it doesn't need it again, so this is disposed of.

Finally, the finished ArmMovie file is placed on to the hard disc or mastered on to a CD-Rom. This method allows about 6Mb of film in Archimedes format (this would be far bigger in original video format) to be compressed down to fit on to one 3.5in floppy disc (about 800K). This is worth 12sec of 12.5fps video.

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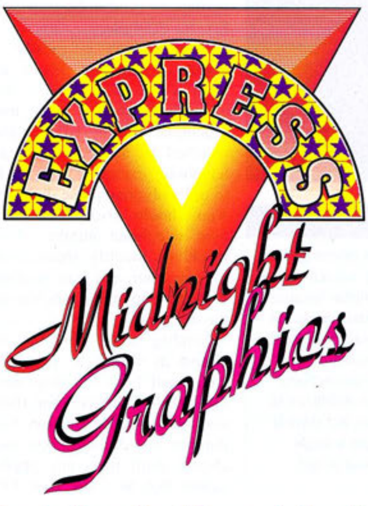
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LOOKING AT THE FAX

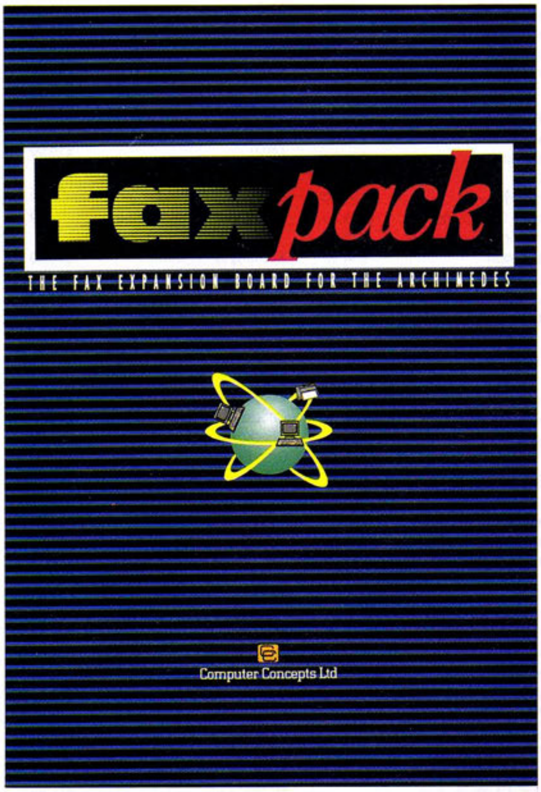
With the Archimedes attracting increasing interest from business users, GRAHAM BELL looks at a package which can turn your Arc into a fax machine

One of the icons of modern technology is the facsimile machine. The need for fast communication means faxes are now found in most offices.

Combining fax and computer technology makes sense – in principle, a Archimedes with a printer, scanner and modem can operate as a computer system, photocopier or fax machine. Add a sound sampler and you have an answering machine too.

FaxPack from Computer Concepts is a fax expansion board which turns your Archimedes/BBC A3000 into a fax terminal. It first appeared some years ago, but it fell foul of problems with Arthur, the original operating system for the Archimedes, and was withdrawn. With the advent of Risc OS plus the *IRQutils* and *Hourglass* modules, these problems have been solved. Fax chip technology has also advanced greatly, so CC has re-designed the product.

The new package comes in the form of some software, plus a half-width podule which slots into the back of the Archimedes and connects with a phone line. Fitting to the Arc easy enough, but you do have to be careful with a tiny ribbon cable used to attach the fax card to the sound input of the machine – it inserts differently on each model of Archimedes (300 and 400 series, 540 and A5000). There is also adaptor so that you can plug your normal telephone and *FaxPack* into the same phone socket.



With a BBC A3000, you can connect up the card via the external podule connector on the back, but you can't fit the audio cable. You must also remember to put the podule in a case – it is far too vulnerable if you leave it sticking out.

APPLICATIONS

Once set up, there are two applications to be copied from the software disc: the a normal printer driver, PrinterFP, and second Faxmngr, used for configuration of *FaxPack* and for fax reception. It is separated from PrinterFP so that you can still receive faxes when you load another printer driver – perhaps to print out a previous fax, for example.

Configuration is mostly a matter of selecting yes or no from a list of options – for example, whether to use touchtone dialling (if you are attached to a modern digital telephone exchange), or stick to old-fashioned pulse dialling. You should also enter your own telephone number. Fax machines identify themselves to each other, and your number will show up on the machine at the other end.

Sending your first fax is almost as simple as printing. You need both Faxmngr and PrinterFP on the icon bar, then you enter the destination fax number in a dialogue box and choose print from any application that uses the Risc OS

HOW FAXES WORK

Faxes have much in common with familiar computer peripherals. A conventional fax machine is little more than a specialised 9600baud modem teamed with an A4-width scanner and printer. The scanner scans the document, and the image data is transferred to the modem and on to another fax machine, where it is printed. In fact, the image is compressed before transmission, so it takes less time to transfer the data for each page.

Most modern fax machines are known as 'group 3', which means that the scanner and printer work at up to 200 dots per inch – about dot-matrix printer quality. But the majority of machines have 'normal' and 'fine' scanning modes, normal being quicker because it is only 100dpi. Combined with imperfections in the scanning and crackly phone lines, it means that most faxed documents are of questionable quality.

To boost the quality on poor phone connections, most group 3 machines step down from 9600baud to 7200, 4800 or even as slow as 2400baud. But there is no standard for error-correction, because a single wrong dot on a page doesn't ruin a faxed image.

printer drivers – *Edit*, for example. When you print, *FaxPack* assembles the page in memory in seconds, then dials the number. If it connects to a suitable fax machine at the other end, it sends your document. You get control of the computer back as soon as it is assembled – the fax data is transmitted in the background, and even on an Arm2 machine, it is barely noticeable.

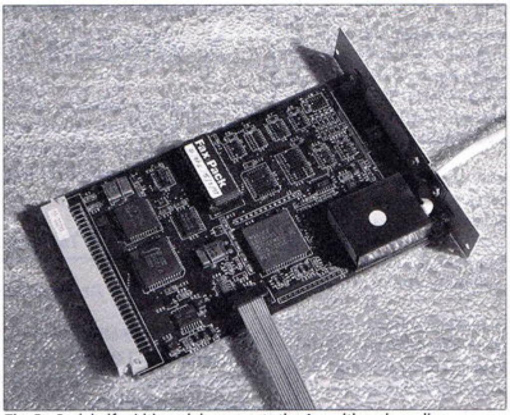
The sounds made during dialling and sending of the data are important, since without sound you don't get any indication of what happening – your fax just goes. If it fails to, because the receiving machine is engaged or won't answer, an error box pops up on the screen. Unfortunately, there is no sound on the A3000.

BETTER QUALITY

Faxes received from *FaxPack* look much better than from most dedicated fax machines: straight lines no nasty streaks etc. With conventional faxes, most errors occur at the scanning stage (which *FaxPack* avoids) rather than in transmission or printing. After transmission over normal telephone lines, even six-point text (this is nine-point) is readable.

However, it is worth turning the Quicktext option off. This is Computer Concepts' replacement for Acorn's font module, used in both *FaxPack* and the Laserdirect printers. Although it works well on a Laserdirect printer, where the resolution is 300dpi (dots per inch) or greater, at *FaxPack*'s 200dpi it tends to miss out pixels in thin horizontal curves – the tops of the 'e', for example. Although it is slightly slower, Acorn's font rasteriser draws skeleton lines through these curves to make sure the letters are continuous. Quicktext ignores the skeleton lines and leaves gaps where the outline is thin.

FaxPack adds a page number to the top of each page, and can include a running header. It slightly distorts the document, making it a bit narrower and longer than a 'true size' printer, but this isn't really a problem because of the informal nature of fax communications. However, stick to A4-size paper and be generous with the page margins when setting up a document, as there can be no indication after you've sent a document that it will be completely legible at the other end.



The FaxPack half-width podule connects the Arc with a phone line

The final software was not available for this preview, and certain features destined for the release version were missing. For example, if you forget to enter the destination fax number in the PrinterFP dialogue box, it pops up an error box when you 'print'. The final software will pop up a box requesting the number to dial – much better. It would be even better to be able to drop a text file containing solely the fax number on the printer driver icon – for example by dragging a field out of a *Squirrel* or another database.

Other untested features of the software include keeping a log of fax traffic, and the intended *FaxPack*-to-*FaxPack* file transfer, enabling a file or whole directory to be transferred between *FaxPack*-equipped machines – you will be able to just drag the file or folder on to the PrinterFP icon.

RECEIVING YOU

Setting the *FaxPack* up for reception is quite straightforward. You need to set up a directory to receive fax files into, and you need to be running the Faxmngr application. Just how you do this varies: if you are blessed with two telephone lines, one can be dedicated to fax traffic, and you can set *FaxPack* to auto-answer. For a more normal setup, where *FaxPack* has to share a line with ordinary telephone conversations, you can't have *FaxPack* answering all your calls with its ear-piercing whistle. You can set it to manual answering, then whenever you pick up the phone and you hear a fax tone from the other end, you use the Faxmngr menu option to begin reception. During reception you can continue with something else, since it all happens in the background and won't disturb normal work.

The quality is not as impressive as faxes you send, although it depends on how good the fax machine is at the other end. But you can read fax files simply by clicking on them. The reading application is simple, with little more than a page up/page down interface. It would benefit from an option to rotate from landscape to portrait, but it is easy to print or read the fax on-screen, crop out a section, or save it as a sprite. The latter option does have problems though, as the sprite files do not work directly with *Paint*.

You also need to clear out your fax directory fairly frequently, as each page takes up to about 150Kb of disc space – don't consider *FaxPack* unless you have a hard disc.

CONCLUSION

For business users, who may be judged on the speed and quality of their output, or for general users who want to communicate with each other, *FaxPack* offers solutions. You can use it with almost any printer driver-aware application, and most of the others would work with the supplied LQemulate application that can make *FaxPack* appear like an Epson dot-matrix printer.

FaxPack works well, offers impressive results and represents exceptional value.

FAXPACK SMARTCARD

The FaxPack podule is one of only a few Archimedes expansion cards provided with its own intelligence. As well as the dedicated fax modem chip that handles the telephone line, there's an 8031 8-bit microprocessor that does most of the work. It only interrupts the Arm chip to transfer chunks of data to or from the dual-port Ram on the podule – a simpler board would use the Arm to transfer individual bytes of data and to control the fax chip directly.

The PrinterFP software shares many features with the Laserdirect, and it first assembles the page in a compressed form in the Archimedes memory. You can configure the amount of memory used and, because of the lower 200dpi resolution of fax, it doesn't need to be a big buffer: 512k is ample.

The current versions of PrinterFP and the Laserdirect drivers share a serious problem when printing out from Squirrel: text fields consisting of more than one line of text can't be printed – a huge black block is all that appears on paper. However, this isn't a problem with any other applications, and text, sprites and drawings are all correctly incorporated into your faxes.

Future software upgrades intended for the FaxPack (and for Laserdirect) include a networkable version which splits the printer driver in two – half at your workstation, half at a 'fax server' on the network. The communication between the two is at Draw-command level: this should clog the network much less than Oak Solutions' current networked version of the Laserdirect driver which transmits the compressed bit-map of the entire page over the net, and should allow printer messages to be routed back to the correct workstation.

PRODUCT DETAILS

Product: FaxPack
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Can you really get something for nothing? **PAUL VIGAY** rounds up the best Public Domain software available for the BBC and Archimedes machines

Free software – sounds too good to be true, doesn't it? Well, that is exactly what Public Domain (PD) software is all about.

In the earlier days of Beeb computing, PD grew mainly from the programming arena. Enthusiastic home users wrote simple programs to solve specific problems – then these solutions were shared out among other users.

Over the years these 'freebie' programs have become known as Public Domain (PD), which means that you can copy and distribute the programs, usually within a set of basic ground rules, such as not altering the program files or code, leaving the author's name intact and not making any commercial profit from distribution.

The past few years have seen a steady build-up of PD program titles for the Acorn range of computers. Some have evolved to such an extent that they now rival commercial software products and represent excellent value for money, usually only costing the price of a disc and postage.

At this point, I should point out the difference between PD software and shareware software, over which there has been some confusion in recent months. Whereas PD software is free to copy, use and pass around, shareware software is free to copy and use only for a limited period.

However, if you use shareware software continuously it is customary to send the author a donation. This in turn gives the author incentive to produce more programs in the future. Some authors will also send you updated versions, or even a manual, if they receive such a donation.

EASY ACCESS

There are numerous ways to get hold of PD software. The easiest is probably by browsing through the Software Showcase pages at the back of *BBC Acorn User*, where advertisements can be found for a handful of PD libraries. Most have a demonstration disc that gives a rough indication of what software range they supply, and you can usually buy the demo for a pound or two.

Another way of obtaining PD software, if you have access to a modem, is via one of the various bulletin boards, which often contain many megabytes of software that you can download for the cost of a telephone call. However, if you are downloading, check the length of the software before you start – it can cost more to download a program, in terms of telephone charges, than to send off for a disc.

Another thing to bear in mind when obtaining PD software is the spread of viruses. Luckily, most PD libraries are fairly diligent and, personally, I have never found a virus on any PD discs. Bulletin boards are perhaps more likely to be infected, but again, most Sysops (system operators) regularly check their downloads for infection. If in doubt, obtain a virus checker which many PD libraries can supply.

As PD software covers practically any subject you can think of, we can really only give you a taste of what is around. Here is a selection of some of the more impressive titles – if you are a subscriber, all of these can be found on our *BAU* subscribers' disc, but you can also obtain them directly from the PD distributors – see our Where to Go box for more details.

GUESSTYPE

All Archimedes machines
Digital Phenomena PD

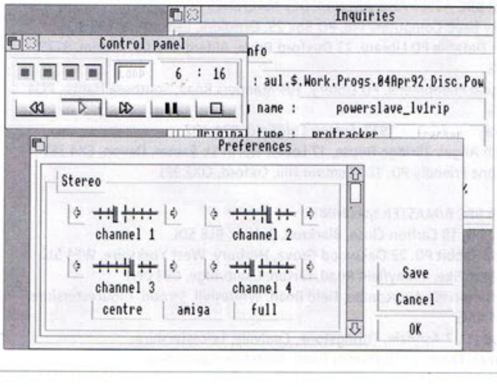
Guesstype is a handy little icon bar utility which will be of great use to bulletin board users or anyone who has accidentally changed the filetype of a file. How often have you received the error 'No run action specified for this file type?' When you encounter a file that has no file type, which you may have downloaded without re-setting its filetype, simply drag it onto the GuessType's icon and it will examine the contents of the file to have an intelligent guess at what its filetype should be.

This obviously works best on database and specialist application files which usually have some recognisable data at the beginning of the file. Files containing pure text are generally all recognised as filetype &FFF (text). When Guesstype

KEEPING TRACK

- ProTrack –Soundtracker player routine
- All Archimedes machines
- Arcaynia PD (written by Bass)

One of the more prolific areas of PD is the range of demos and soundtracker tunes available, many ported from other computers, such as the Amiga. Hugo Fiennes wrote the first Archimedes program to playback tunes from Amiga SoundTracker, a program which over the years has been extended and modified to become a slick and professional-looking program. ProTrack has been produced by the Belgian Archimedes Software writers, Society, and is an impressive addition to any PD collection. Running from the desktop and totally Risc OS compliant, ProTrack will play any tracker tune, as well as provide you with a range of control panels enabling you to examine and control the tune in more detail. Four panels are provided: a control panel which lets you fast forward, play, rewind, stop or pause the tune currently being played; an enquiry window, which allows you to examine more specific details such as the tune length, number of samples used, memory size and effects used; a monitor screen, which lets you see the actual tracker data and musical waveforms, together with a spectrum analyser type display, all updated in realtime as the music plays; and finally, a preferences window, which lets you alter the stereo position of each channel playing. Pleasant 3D icons have been used throughout the overall package.



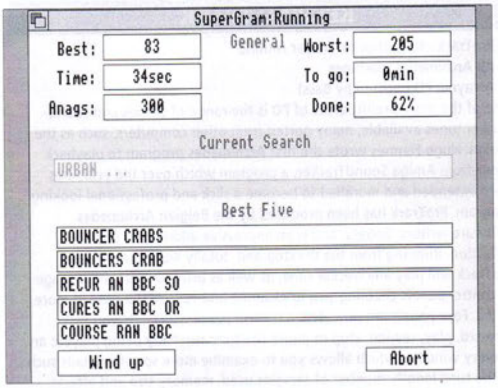
INTELLIGENT ANAGRAMS

- SuperGram – Intelligent Anagram finder
- All Archimedes machines
- The Datafile (written by William Tunstall-Pedoe)

Supergram is not a run-of-the-mill anagram solver. Indeed, if simple, single word anagrams are what you're looking for, a word processor spellchecker will do. Where Supergram excels is in creating multi-word, intelligent anagrams from phrases and sentences. In fact, you can customise it to put varying degrees of emphasise on its weighting so that you can create satirical, flattering, political or even rude sentences. It is a fully Risc OS application, which is even multi-tasking so that you can continue working while your computer shifts through hundreds of words in the dictionary. All you have to supply is a simple phrase to form anagrams from, set a few simple options such as what emphasis or bias you want, click OK and off it goes.

After a few minutes, a list of words start to appear in a window. Being multitasking, you can watch as it sorts out the best ones chosen so far. After a few moments you can peruse through pages of most amusing anecdotes. Supergram has a good knack of being able to sort words according to context, so that they can have a subtle way of linking with the original text. For example 'I am plastic' is one of the anagrams produced from the source word 'capitalism', while 'Risc workstation' produces 'it is star crown OK'.

Many hours of fun can be had by compiling insults from peoples names, answers to questions or thinking up puzzles to give to friends. Supergram just goes to show how professional looking Public Domain programs can be.



WHERE TO GO

To obtain any of the PD items mentioned in this article, and many more, here is a list of current PD distributors:

FOR BBC A3000 AND ARCHIMEDES MACHINES

Busy Beeb Computers Ltd, PO Box 25, Ormskirk, Lancashire, L39 3QR
The Datafile PD Library, 22 Duxford Drive, Aldergrove Co, Antrim, BT29 4BG
Digital Phenomena, PD Library, 104 Manners Road, Southsea Hants., PO4 0BG
Arcaynia, PO Box 1927, Sutton Coldfield, B74 3QZ
Arch Angel, 2Bridge House, 17 Lower North St, Exeter, Devon, EX4 3ET
Ozone Friendly PD, 180 Cumnor Hill, Oxford, OX2 9PJ

FOR BBC B/MASTER MACHINES

BBC PD, 18 Carlton Close, Blackrod, Bolton, BL6 5DL
Mad Rabbit PD, 22 Oakwood Grove, Horbury, West Yorkshire, WF4 5JE
Robert Pike, 4 Mayfield Road, Girton, Cambridge, CB3 0PH
Cotswold PD, Maycombe, Field Road, Whiteshill, Stroud, Gloucestershire, GL6 6AG
8-bit PD, 7 Ashdale, Thringstone, Coalville, Leicestershire
Screen Teach, 21 Highlands Road, Rochdale, Lancashire

has made a guess at the filetype of the given file, it will display a small information box with two options: SetType and Retry. SetType will set the filetype of the file to that currently guessed, whereas Retry will force Guesstype to make another guess. This may become more vague the more guesses you make, but it will provide some possible ideas if you are completely stumped as to the unknown file's origin.

SAL

Save A Life (Emergency First Aid teaching)
BBC Model B/Master
Screen Teach

Sal is an informative and useful PD version of a larger commercial program, to help beginners learn the rudiments of emergency first aid. It is in the form of multiple choice questions, based upon the sort of accident you may witness in real life. Each question moves on from previous actions and responses, giving you full instructions and a tutorial if you choose the wrong answer.

It also helps by explaining why you went wrong, rather than just scoring a negative mark. This can help people learn by their mistakes and show you how a chain of actions follow each other. The program is easy to use and full instructions are provided along the way, so *Sal* would make an ideal teaching aid for children as well as first aid clubs where not much computer knowledge is needed.

MEGAMIX

Music demonstration
BBC Model B/Master
Eight-bit PD

No doubt many BBC micro owners will have jealously watched their A3000 and Archimedes-owning friends running impressive music and scrolling text demos. Well, now a group of programmers calling themselves The Yorkshire Boys have managed to cram sampled sound and music into a standard Beeb.

The effect is dazzling, especially when you consider that there is less than 32k to play with – although sideways Ram is used for extra effects, if fitted. It is good to see that impressive demos are still being produced for the Beeb. Considering the sound abilities of the machine compared with the Archimedes, this really is quite impressive.

BDARK

BBC Model B/Master
Digital Phenomena

Due to the large amount of memory used by many Archimedes programs, the archiving of programs is often called for. Archiving essentially involves reading a file and compressing it by eliminating consecutive similar bytes. By compressing files, you can greatly increase the amount of data you can store on a disc, sometimes increasing the capacity by two or three times.

It also allows you to store multiple files within one file. This can help people downloading from bulletin boards, who only need to download one file rather than lots of little ones. Although the BBC micro has a much smaller memory than the Archimedes, there are still times when archiving programs can be beneficial, such as when cramming more data on to a disc.

Bdark will allow you to extract files that have been archived using *Spark* on the Archimedes. This is the accepted standard so far and allows Arc users to compress files for transferring to the Beeb. Using it is fairly simple – you simply copy *Bdark* and the file to be de-compressed on to a blank disc, and then type *BDARK <filename> where filename is the name of the file to be decompressed. The files will then be unsquashed and saved on the disc, so you can run the program as normal.

PD TIPS

The success of Public Domain relies in as many people as possible knowing about it – which is why we will be running more PD-related articles in BBC Acorn User in the future. So, If you want to pass on details of PD software you distribute or know about, or if you have any questions about PD, why not drop us a line? Write to: PD Tips, BBC Acorn User, 20-26 Brunswick Place, London N1 6DJ

BBC A3000 & ARCHIMEDES SOFTWARE











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GAMES

GAME SHOW

This month there is a snippet of very welcome news for any gamesters who have recently acquired the latest jewel in the Acorn crown, the Archimedes A5000.

The Fourth Dimension, one of the leading software houses in the Acorn games market, has come up with a solution for anyone who may have experienced difficulties when playing games on the new machine. The A5000 has a newly-designed Risc OS 3 operating system, which is slightly different to the Risc OS 2 system found in other Archimedes and BBC A3000 machines. This has been causing a few problems with certain games which do not seem to work properly.

As a result, the Fourth Dimension tweaked some of the games in its range and reports that they now work perfectly on *all* of the Risc OS machines. The company is offering a free disc replacement service for any users who have Risc OS 2 versions. All you have to do is send back your discs – keep the box and manual – to The Fourth Dimension, 1 Percy Street, Sheffield S3 8AU, with a short note requesting the upgrade.

Meanwhile, the sequel to The Fourth Dimension's *Nevryon* – 'imaginatively called *Nevryon 2*', to quote the author – will be released this summer. But, you may well ask, what could possibly be added to the original game, given that it was already as busy as a bustling beehive.

Well, the short and simple answer is this. Two people will now be able to play simultaneously, blasting yet more nasties from space ships and flying along horizontally, shooting and collecting bonuses, as in the original. The play area will also be enlarged vertically to make room for even more flying objects for you to eliminate.



Watch out for the Archimedes version of The Last Ninja, from Superior

My one plea to The Fourth Dimension is this: when you run out of lives in the new version, *please* could you design it so that it is possible to start playing again straight away. In the original *Nevryon* you had to wait nearly two minutes while high score charts, wiggly graphics and flashy titles rolled by.

BRIDGE TOO FAR

Any bridge players out there? Well, you will be pleased to know that Krisalis Software intends to release an Acorn version of its new game *Omar Sharif's Bridge*, in an effort to take the company upmarket.

Krisalis' Tony Kavanagh told us that the game had gone down a storm in the USA and he wants British players to have an opportunity to get involved. And you never know, it may encourage many more people to start playing this fascinating game – in fact, I might even learn how to play it myself!

A completely new game to the Acorn world, also on its way from Krisalis, is the highly successful game *Populous*, which has gathered wide acclaim on other computer formats, especially Amiga. The game won't be out until later in the year – watch this space for more details.

Meanwhile, you might be interested in a little statistic regarding Acorn's growth in the games world. Krisalis reports that it sold over a 1000 more copies of its game *Mad Professor Mariarti* for Risc OS machines than it did for the Atari ST, once a computer to be reckoned with on the games scene – the best will always out!

CHEATING

A nice little cheat program to make life easier for players of the adventure game, *Twin World*, has been sent in by Stephen Cook of Edinburgh.

The program (see right) enables you to alter the saved position file to make you start on any level, between zero and 22. And although it is possible to change other factors, such as the score and weapons, Stephen has deliberately left these out of his program to maintain some element of fun in the game (although there is no reason why the hackers among you can't put them in).

To use the cheat, play *Twin World* and save your position, then get into Basic. To do this from the desktop, press F12 and type BASIC. Then enter the program as it appears here and save it to the *Twin World* disc by typing *ADFS then SAVE"CHEAT" before typing RUN to begin cheating! Thanks to Stephen for that.

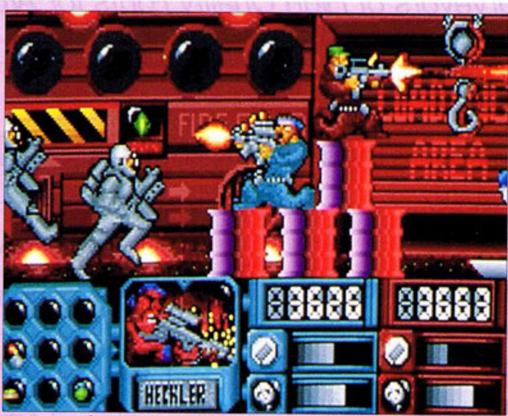
Another tip for cheating at The Fourth Dimension's shoot-'em-up, *Apocalypse*, has been sent in by Robert Miles of Homerton, Devon. In *Apocalypse* you fly around a brilliantly coloured planet, firing yellow photons from your flying saucer at various targets below. I think they're supposed to be the bad guys, although the other saucers aren't particularly neighbourly either. To use the built in cheat, just type in ELIZA, while on the surface of any planet, to go to any level.

Sam Greenhill

```
10 REM Twin World Cheat by Stephen Cook
20 DIM info%(100)
30 S%=OPENIN "$.!TwinWorld.SavedGame"
40 index%=0
50 REPEAT
60 info%(index%)=BGET #S%
70 index%+=1
80 UNTIL EOF #S%
90 CLOSE #S%
100 PRINT"Current saved level is level ";info%(0)
110 INPUT"Change to level (0-22): "info%(0)
120 S%=OPENOUT "$.!TwinWorld.SavedGame"
130 ni%=0
140 REPEAT
150 BPUT #S%,info%(ni%)
160 ni%+=1
170 UNTIL ni%=index%
180 CLOSE #S%
190 END
```

AGGRESSOR

Atomic Software
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£19.95 inc VAT



Aggressor – fun, but not as aggressive as it should be

Do you remember the alien out of *Alien* – tall, multi-limbed and ugly, with that big shiny shell thingy on its back? Well, some of the creatures in *Aggressor* – all wearing a sinister purple exoskeleton – are the spitting image of the old beastie (whom we have named Egor), only here they dash about in search of trouble with all the grace and coordination of an American Football player. So what do you do with them? Well... shoot 'em, of course!

But no sooner has the Egor hit the ground than you have something else to deal with, typically an oversized pink cockroach with an attitude problem, a hyperactive blue monkey with a bee under its bonnet, or an unaffectionate swarm of bees with a chips on their shoulders. Plan of action this time? Hmm... shoot!

And that's about the extent of the game; definitely in the 'if it moves shoot it' category. It is set sometime in the future, somewhere in space and features a couple of hard nuts named Heckler and Kosh in a war against the weirdos.

Although it sounds like it should be my kind of game – full of action, enhanced weaponry awaiting collection and best of all a two player option – somehow *Aggressor* just doesn't make the grade. The scenario scrolls horizontally and Heckler, Kosh (or both) have to amble along, ducking and diving enemy fire and even jumping over strange holes in the ground, popping the baddies and collecting crates full of bonus gadgets which float down under parachutes from time to time. The graphics are actually fairly good, but despite some nice detail, they lose smoothness in the heat of the action.

The trouble is that the whole game is rather too slow and you get about as much response out of Heckler and Kosh as you would from a dead duck on a cardiac monitor. Not only do they tend to ignore important signals like 'stop firing now please...' but they can't run half as fast as Egor, or the strange animals he hangs about with, placing you at a distinct disadvantage.

Also, in two player mode you are both confined to the left half of the screen, which causes severe annoyance when the forward positioned player has to wait for the lagging one to catch up.

Basically, the game looks and sounds good and has the sort of mindless plot I seem to like, but sadly the lack of speed does destroy the fun. Fast smooth action is the key to any game of this sort and lacking this makes *Aggressor* seem like like a concert without a band or a football match without the teams.

Sam Greenhill

SWIV

Krysalis Software
Tel: (0709) 372290
Price: £24.95 inc VAT



Just like the real thing – arcade quality from this new Archimedes game

Krysalis continues its tradition of bringing the best games to the BBC A3000/Archimedes by releasing its latest offering, *Swiv*. Hailed by many as the best shoot-em up available for any computer, be it eight or 16-bit, *Swiv* is a a real arcade game in every way.

Set in the not too distant future, *Swiv* puts you in charge of two vehicles, a helicopter and a jeep. Both are armed for combat and have their own particular uses. The jeep is land-based and dodges behind buildings to avoid enemy fire, while the helicopter flies around the whole play area.

Both vehicles can be controlled simultaneously using the keyboard or joystick. When both the jeep and helicopter are used, it is best to have two players controlling the movement. It's not really possible to switch from one to the other and back again without losing lives.

Key controls can be customised to allow two players to fit comfortably around the keyboard, although unfortunately, only the main keys (not the function, cursor, edit or numeric keypad) can be used. Support for both The Serial Port and RTFM joystick interfaces is built into the game.

The game is based around a continuous vertically scrolling display, over which you drive or fly. The play area is, in fact, one long strip from beginning to end and a special feature of the program allows new sections to be loaded in while you are playing, without any apparent break in play.

Because there are no breaks, the action is fast and furious and just gets more intense the further you progress. After three lives have gone, a credit feature (rather like stoking an arcade game with lots of 20ps before playing) allows you to continue from where you die.

The graphics and sound are well up to arcade standard, perhaps not quite as fast. Like most of the Krysalis games, *Swiv* is a direct conversion of the 16-bit version, with no use made of the Archimedes' superior sound and graphics capabilities. It doesn't detract from the game play, but more colour would have been nice.

If you were to stick an Archimedes playing *Swiv* in an arcade, you could almost believe it was the real thing. So if you're fed up of spending all that 'loose change', why not invest in a copy of Swiv?

Rob Miller

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BACK TO BASICS

New software could make programming tasks much easier. **DAVE ACTON** gives some first impressions

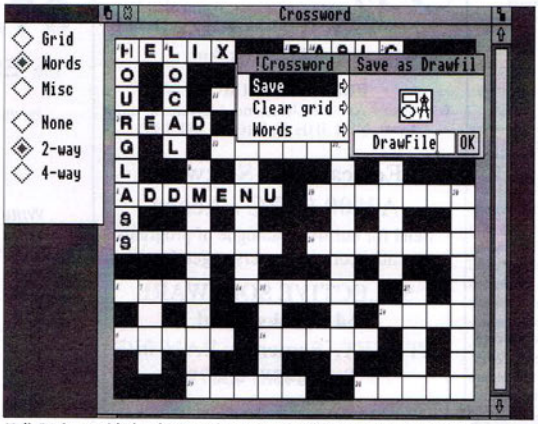
Among the many attempts to make Risc OS a friendlier environment for programmers to work in, *HelixBasic* from Craddock Computer Systems is perhaps the most imaginative. Although I say new, it is still under development, but I have looked at a pre-release version to see whether progammers' lives are about to be transformed.

APPROACH

The traditional approach to assisting application writers has been to provide various editors, procedure libraries and so on. This is all very well, but many Basic programmers simply want to be able to write a short program and see it running in a window.

HelixBasic is actually a Basic V interpreter (running independently of the standard Basic) which transparently multi-tasks, running your program in small 'time slices' while allowing other applications to run alongside it. In this respect it is what many programmers will want.

I wrote a short application in *HelixBasic* – a crossword grid designer – to see how well it performed. Although hindered by some of the problems yet to be ironed out, the program certainly ended up much shorter than the equivalent in ordinary Basic. Some tasks, particularly the displaying and saving of the finished crossword grid as a *Draw* file, were remarkably easy.



HelixBasic provided a shortened program for this crossword designer

The standard Basic commands are supported where appropriate, but there are many new ones that specifically deal with the desktop – too many to describe in full, but as an example I decided to look at menus.

If you are building a menu from scratch in a Basic application you normally require a set of functions and procedures to create and interpret them. Some programming aids allow you to build menus as text files, but this is often limiting since menus are at their best when 'dynamic' – in other words, options should really change (be ticked, greyed out and so on) depending on the circumstances. *HelixBasic* provides two keywords – MENU and ADDMENU – that greatly simplify the creation of menus, while maintaining flexibility. The main menu in my simple application was set up with just these commands:

```
MENU main_menu,"Crossword",-1
ADDMENU main_menu,"Save",SAVE
ADDMENUmain_menu,"Clear grid",MENU clear_menu
ADDMENU main_menu,"Words",GREY cant_enter,MENU word_menu
```

The submenus clear_menu and word_menu were defined elsewhere. The keyword SAVE means a save box is brought up and the last entry in the menu is greyed out whenever cant_enter becomes true. This illustrates an important feature of *HelixBasic* – the ability to link things to particular variables, so that any change in their value is automatically reflected elsewhere.

Another example is window titles. These can be fixed, or linked to variables so that changing them can be as simple as title$="New title". Similarly, commands can be linked to particular actions, so clicking on an icon or selecting a menu entry can be set up to call a procedure, close a window or whatever.

This may cause a few surprises for newcomers to multi-tasking who expect their programs to be executed line-by-line. It is a feature of Risc OS (and not a limitation of *HelixBasic*) that you must beware of events taking place in an unexpected order.

GRAPHICS

Another key feature of *HelixBasic* is the way it treats graphics. Outside the desktop, when you draw a line on the screen you expect it to stay there. In a window, you may not always be able to see it, so your application needs to keep track of lines, circles, text or whatever so they can be redrawn whenever necessary. *HelixBasic* quite logically stores all graphics as a sort of internal *Draw* file. Indeed, you can save the contents of a window as a *Draw* file with the SAVEDRAW command.

This facility means that my crossword designer simply had to plot the grid with a couple of FOR...NEXT loops and a few RECTANGLE FILLS, and then the finished product could be saved directly into *Draw*. Well, in fact a couple of the teething problems got in the way. In the pre-release version, fonts and text were not saved in the file and direct application-to-application saving was not supported, but these will be featured in the final version.

Although you can use *Edit* (as I did) to create your programs, a new and faster editor is promised, with a more graphical approach to window design. Another area where improvements are promised is in error trapping – at present, responses are far from ideal, such as 'Abort on data transfer' when you miss out the keyword THEN.

Geoff Craddock of CCS told me that the full release version of *HelixBasic* would be available this month and I look forward to trying it. Whether programs will run faster with the new version is yet to be seen – we may have to wait for the *HelixBasic* compiler, due later in the year.

CONCLUSION

The idea behind *HelixBasic* is essentially a very good one. Schools in particular will find the simplicity appealing and, with a compiler, a good manual and a fast editor, many programmers may be tempted.

Having said that, it will take a fair bit of work to transform the current development into a finished product. If CCS manage it, then they might well have a hit on their hands.

PRODUCT DETAILS

Product: HelixBasic
Supplier: CCS
Tel: (0604) 760991
Price: £85.06
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Machines: All Risc OS machines

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SOFTWARE SHOWCASE

ACORN USER ADVERTISEMENT PAGES – APRIL 1992

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The smArt package comes with over two dozen files on subjects ranging from shops to cars, and churches to British Isles maps. Available as separate products are discs of smArt files on specific themes such as Leisure, Heraldry, Faces, Fashion, Homes, Trees & Gardens, and Dinosaurs.

smArt £55 (NZ$ 198) smArt discs £16 (NZ$ 59)



For those wishing to create their own smArt files, smArtFiler is an application which compiles smArt files from your source Draw files. Full instructions are provided along with lots of examples. Individual components may be scaled, rotated, and placed in front of or behind other components. Menu entries may be specified.

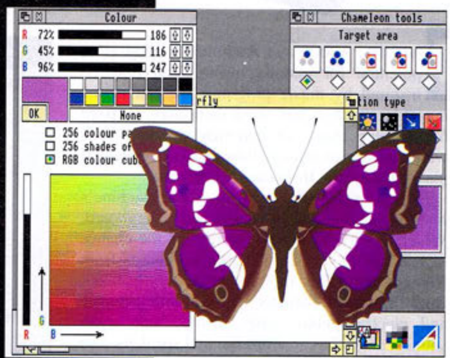
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Chameleon is an ideal companion to smArt, and a must for anyone who needs to make quick and easy colour changes to Draw files. As well as palettes for 16 and 256 colour modes, there are options for 256 shades of grey and a RGB colour cube which provides thousands of colours. Colours may be selected from other Draw files so can be copied from one picture to another. Colours may also be changed in HSV values; Hue, Saturation and Value. Edited files may be saved as normal Draw files or as colour separations. A clever Undo and Redo facility allows virtually any number of colour changes to be cancelled and then reinstated. Zoom and Magnification facilities allow accurate editing of small areas.

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But to make the most of your machine's musical capabilities, you really need a keyboard. Which is why we are giving readers the chance to win one of the latest digital keyboards from Roland, the EP-3 digital piano, worth £299. Built-in sounds features include both acoustic and electric piano, vibes, strings and organ sounds, as well as an amplifier and speakers – so all you have to do is plug in and play!

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HOW TO ENTER

The competition is open to all readers – simply answer the questions opposite, complete the tie-breaker and send the coupon to: Roland Competition, *BBC Acorn User*, 20-26 Brunswick Place, London N1 6DJ. The closing date is Friday March 27 1992. Usual competition rules apply.

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2. How many sharps are there in the chord of C major? ....

3. Name the music application supplied with the BBC A3000/Archimedes? ....

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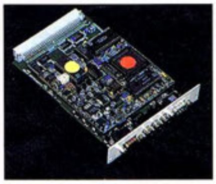
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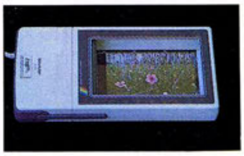


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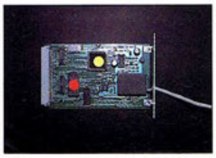
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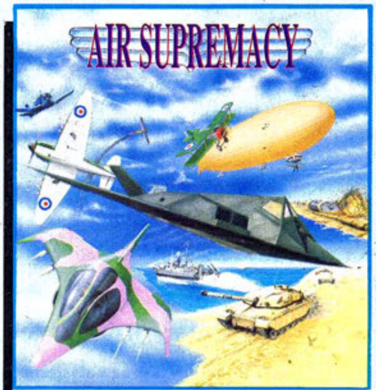
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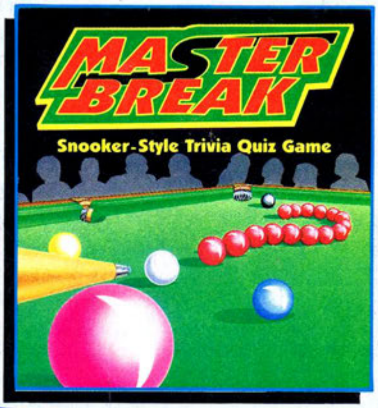
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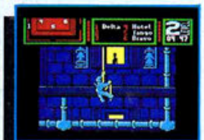


BBC Micro/Master


A3000/Archimedes






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